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THE WILD ANIMALS OF AUSTRALASIA

1. GREAT GREY KANGAROO (*Macropus giganteus giganteus*), MALE

Photo A. Enor

Fr.

THE WILD ANIMALS OF AUSTRALASIA

EMBRACING THE MAMMALS OF NEW GUINEA & THE NEARER PACIFIC ISLANDS

BY
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WITH A CHAPTER ON

THE BATS OF AUSTRALIA AND NEW GUINEA

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THIS BOOK IS DEDICATED
TO
AUSTRALIAN MAMMALOGISTS
IN THE HOPE THAT IT WILL PROVE
OF ASSISTANCE IN THE STUDY
OF OUR MAMMALS

PREFACE

THE chief object in bringing out this work is to collect in one volume information concerning all the Australasian mammals, thus providing a convenient handbook for their further study.

The nomenclature of the marsupials and monotremes has been based on that of the catalogue issued by the British Museum, in which these groups have been admirably treated by Mr Oldfield Thomas. We have grouped the bats, the carnivora, rodents, etc., in their accepted order.

Literature dealing with Australian animals is very scattered, and we cannot attempt in this handbook to quote all the synonymy. As far as possible, however, some salient reference has been given that will enable the student to look up further details of any given species.

Many species have here been described which may, when larger series are available, be grouped together. Australian museums are very short of material to work upon, and many of the types are in British or foreign museums. We appeal to Australian naturalists, therefore, to endeavour to make our local collections as complete as possible while yet there is time, so that we may hand down to posterity a thorough knowledge of our animals, many of which are rapidly disappearing.

We are indebted to Mr Ellis Le G. Troughton, of the Australian Museum, for the section on bats with which the book opens, for reading the proofs of the whole of the book, and for many helpful suggestions. Valuable help of a similar nature has been given us by Mr A. H. Chisholm. We have also to thank Dr C. Anderson, M.A., Director, and Mr W. A. Rainbow, Librarian of the Australian Museum, for facilities and assistance in research. Thanks are due also to Messrs H. A. Longman, J. A. Kershaw, Edgar R. Waite, C. E. Lord, and L. Glauert, directors of museums in other states, for details of some of the specimens under their care. Finally, cordial acknowledgment is offered to Mr Anthony Hordern, of Sydney, for financial assistance in this enterprise.

Photographs which are not otherwise acknowledged are by the authors.

A. S. Le S.
H. B.

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THE WILD ANIMALS OF AUSTRALASIA

INTRODUCTION

We have in Australasia to-day about four hundred species of mammals, belonging to seven distinct groups. These are bats, wild dogs, seals, dugongs, rodents, marsupials, and monotremes.

The bats do not show any marked differences from those of other parts of the world. It would hardly be expected that they should, as they range wide and free, and are not restricted by seas. We have, however, a great number of diversified forms, belonging to seven different families.

The canines, represented by the well-known dingo and the dog of New Guinea, show very close relationship to the domestic dogs, and through them to the Northern wolves. There is no doubt, therefore, that these were not indigenous. From the fact that remains of the dingo have been found in association with those of extinct marsupials it has been deduced that it was in the country long before man. We are inclined, however, to attribute this association to geological change. Its advent does not seem to have had much effect on the native animals, with the exception of the marsupial wolf and the Tasmanian devil; these have disappeared from the mainland, presumably owing to this cause. The dingo, however, took the line of least resistance, for the most part feeding on small ground animals.

Our native seals and the dugong are representatives of species very widely distributed over the world, and show only slight differences from those of other countries.

Australasian rodents all belong to one family, the Muridæ, or rats without cheek-pouches. These are divided into two sub-families, representing water-rats and terrestrial rats. The water-rats are of very primitive type, having only two molar teeth in each side of the jaw; one of these animals, however, is very highly specialized to enable it to live in the swift streams that rush down from the lofty mountains of New Guinea. The terrestrial rats show much the same lines of development as the small rodents in other parts of the world. Some of the inland forms have the long hind-limbs and large ears that characterize the jerboa-rats living in a similar class of country in America and Africa, but they have not become so specialized in this direction as those living in the Sahara. All our native mice and most of the rats have from four to six mammæ only; this is a tremendous handicap to them in their competition with the imported forms, which have from ten to twelve mammæ.

It is in the marsupials and monotremes, however, that we find animals very different from other world types. In the history of the world there has been a very gradual but marked change in animal life, which advances through fishes, reptiles, and marsupials to the higher forms of life that we know to-day. During the period when the marsupials were predominant Australasia became separated from the rest of the land-masses, and the animals there were isolated.

Animals reach their highest development where most forms are living in association with each other, as it is necessary for them to keep their relations with one another fairly well balanced. In this way, as the herbivores became fleeter and better able to defend themselves the carnivores that prey upon them advanced in a corresponding manner. This would account for the highest general development of wild animals having been reached in Africa, followed in turn by Europe and Asia, America and Australia.

The marsupials and Australian rodents, left in a land that was undergoing little or no change, and with no competition except among themselves, have advanced very slowly, some types even being handed down from Mesozoic times unaltered. They have, however, by adaptive variation become exactly suited to their environment. They have occupied every possible class of land, whether mountain or plain, swamp or desert; and they live in the trees, on the ground, or under earth. It is very interesting to note that the development that has taken place has been along parallel lines of animal forms in other parts of the world. Thus we find the thylacine very like a dog; some of the phalangers might well be mistaken, as far as external appearances go, for lemurs, and the dasyures for civets; while the marsupial mole is almost an exact counterpart of the true moles in other parts of the world.

The general character of the marsupials and their means of offence and defence are in keeping with their primitive organization. They are not usually aggressive, nor have they the instinct of self-preservation at all highly developed. We can easily understand, therefore, how they failed to survive in competition with the higher animals in other countries. The marsupial carnivores are very tractable, and one can handle some forms immediately they are caught. How different from a wild cat or a weasel! When a herd of kangaroos is attacked the males scatter, each seeking its own safety, leaving the females and young to the mercy of the enemy. This is not the way with the hoofed animals, the males of which follow in the rear of the retreat, and form a guard for the weaker members of the herd.

This brings us to the tragedy of the Australian mammals. The majority of them seem destined quickly to disappear, not so much from the opening up of the country and settlement of the land as by reason of the introduction of wild animals from other parts of the world. There are in a wild state in Australia to-day the fox, the cat, the rabbit, the hare, the black rat, and the common mouse, all of them European animals which have gone far ahead of the marsupials in general development, and which must inevitably occupy the heritage of the more primitive types of this land.

An Australian animal probably could not establish itself in America; an American animal would be hard pushed to gain a living in Europe, or a European animal in Africa; but reverse the order and we have the avalanche. The case is exactly paralleled by that of the European and the aborigine among mankind.

THE BATS OF AUSTRALIA AND NEW GUINEA

By ELLIS LE G. TROUGHTON
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ORDER CHIROPTERA

BATS possess all features typical of the class Mammalia, producing their young alive, and nourishing them by milk sucked from the thoracically placed teats of the mother, as well as being warm-blooded animals, breathing air by means of lungs. The bats, however, are sharply distinguished from all other mammals by possessing the power of true flight, for which purpose their fore-limbs are specially modified. There is a kind of spurious flight possessed by some other mammals, such as flying squirrels and flying phalangers, but this does not entail any special modification of the fore-limbs, and cannot be called flying, as it is only the prolongation of a downward leap by the aid of a well-developed skin-fold along the sides of the body which is attached to the fore- and hind-limbs. A bat, on the contrary, can fly as efficiently as a bird; its flight is effected by continuous upward and downward strokes of the wings, and can be sustained as long as muscular power permits.

The most obvious and important characteristic of bats being their faculty of flight, and the apparatus for this being mainly furnished by the fore-limbs, the order to which they belong is appropriately named Chiroptera, meaning hand-winged. In a bat's wing the humerus of the upper arm is only moderately elongated; in the forearm there is a rudimentary ulna, and the single complete bone, corresponding to the human radius, has a very great length, this extraordinary elongation being carried to a still greater extent in the bones of the hand, which, excepting the thumb, form long slender rods. The thumb is free, and terminates in a hooked claw, which can be used for climbing or suspension, but the four fingers, of which the third is the longest, are connected by the thin but strong membrane forming the soft part of the wing. In consequence of the connexion of the hind-limb with the wing-membrane the knee-joint is directed backward instead of forward, and this peculiar arrangement renders the bat's movement on the ground an awkward kind of shuffle.

The ancestors of bats, no doubt, developed membranous attachments similar to those of the flying squirrels, which in the process of evolution became more specialized; the fore-limb bones increased in length, and the membranes eventually enveloped the spaces between the long fingers; and, instead of being able only to glide in a sloping direction downward from some high point, the bat was able to propel itself at will through the air in all directions.

As to their origin, it is a remarkable fact that among the host of extinct animals which are now known none have been discovered in any way connecting bats with other mammals. Remains of bats very closely resembling existing kinds are met with in the upper part of the Eocene Period, showing that the order is a very ancient one, and that we shall have to go back still earlier before meeting with creatures intermediate between bats and other mammals. In spite of this, naturalists have no hesitation in believing that bats originated from mammals of ordinary quadrupedal, terrestrial habits. In fact, there can be little doubt, according to authorities such as Dr William K. Gregory, that the Chiroptera are an offshoot of late Mesozoic or early Tertiary arboreal insectivores (shrews, moles, etc.). A living member of the order Insectivora, *Galeopithecus*, exhibits the highest degree of aviation of any of the Mammalia except bats, and both were evidently derived from a common stock. The relationship of *Galeopithecus* to the fruit-bats is indicated by important characters. For example, the skin-fold of *Galeopithecus* extends between the long fingers as well as surrounding the body, and is supplied with the same muscles and nerves as in the Chiroptera; also, when asleep this insectivore hangs head downward, suspended, like a bat, by its hind-claws.

There are so many species of Chiroptera indigenous to Australia and the neighbouring islands that it has been found possible to deal only with those of Australia and New Guinea; it is hoped that bats secured in the more remote localities will be forwarded to the local museum, where identifications will be gladly supplied.

Of the habits of bats very little is yet known, as their volant habits and mode of life render them difficult to observe and to collect; such habits as are known will be included under their appropriate headings. Bats are often regarded with superstitious awe and as omens of ill-luck by the general public, few people realizing the high place these mammals occupy, next to the order Primates (including man and the creatures nearest allied to him), in the classification of the animal kingdom. In fact, Dr William K. Gregory in his *Orders of Mammals* advances the hypothesis that the Insectivora, Chiroptera, and Primates have had a common origin from a family of primitive insectivores.

So thoroughly are bats adapted for life in the air that they seldom resort to the ground, and even then generally leave it as soon as possible by ascending a tree, rock, or wall, whence they again take flight, or on which they settle themselves, hanging head downward by the feet in the favoured position of repose. Most bats feed and drink while on the wing, and the females always carry their young, which cling tightly to the parent's body.

Much has been written and strange beliefs expressed about the blood-sucking vampire-bats, but this habit is confined to two species of small bats ranging from Central America to Brazil; the stomachs of these two bats are simple and tube-like, being adapted to the digestion of the blood which probably constitutes their whole diet. There are several species of javelin bats found in Brazil which travellers have accused of blood-sucking from wounds made in the toes of men, but experts believe that the latter only vary their diet by the habit, and do not subsist on blood entirely, as do the former species. It appears that the blood-sucking vampires' method of attack is to settle down after hovering over the part to be operated upon; they then shave away a thin portion of skin by the razor-like action of their upper incisor teeth, causing the blood to ooze out from the small capillary vessels, when it is sucked up and swallowed.

However, there are no blood-sucking vampires among the Australasian bats, which may be divided into two great groups: (1) the large fruit-eating bats, the Megachiroptera, wrongly called 'flying foxes,' and properly known as fruit-bats, and (2) the small insectivorous bats, the Microchiroptera.

EXPLANATORY

Keys and how to use them. The keys are intended briefly to summarize the essential characters of genera and species. They may seem complicated, but constitute the quickest method of identification, by the simple process of eliminating a specimen from each opposing section of the key until its characters fit those of a particular sub-section.

For example, a reader secures a bat, and checks its characters with those of the two sub-orders. If it belongs to the Microchiroptera he turns to the key to the families of that sub-order, which is arranged in alternative sections and sub-sections; the letters before those sections are mere symbols without alphabetical value, and are used to emphasize the alternative headings. If the characters of a specimen do not agree with those of section *A* they will probably agree with those under the alternative section *AA*; it may then be further restricted by comparing its characters with sub-sections given under section *AA*, say under *D* or its alternative, which would be *DD*. The process would, of course, be the same in either sub-order. The relative insetting of the various sections of the keys accentuates their alternative nature, also serving as a guide to the sub-sections within them.

Where it has been impossible to supply keys, owing to lack of adequate specimens for examination or faulty descriptions, the geographical range of genera and species will assist their identification, apart from their individual characters.

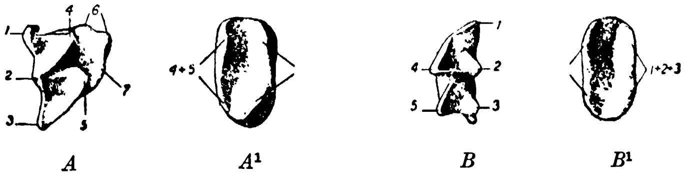
Teeth. A definite indication of the sub-order to which a bat belongs is found by comparing its teeth with the diagram below, illustrating the type of molar found in either sub-order.

The teeth-formulæ given under each genus may readily be understood by referring to the diagrams, on pp. 26 and 45, of the Megachiroptera and Microchiroptera respectively, which illustrate the arrangement of the maximum number of teeth possessed by any genus, in either sub-order, dealt with here.

SUB-ORDER MEGACHIROPTERA

Large Fruit-eating Bats

Characters. Face fox- or dog-like; the nostrils simple openings without any leaf-like folds of the skin surrounding them. Ears small and simple; the inner and outer sides of the projecting portion, or conch, are united at the base so as to form a complete ring. Crowns of molar teeth smooth or nearly so, elongated from back to front, and divided by a longitudinal groove (see diagram above). Thumb always, first finger sometimes, provided with a claw. Tail much reduced or absent.



A and *B*, Typical Teeth of an Insectivore, comparable to the Upper and Lower Molars of an Insectivorous Bat (Microchiroptera)

A^1 and B^1, Typical Upper and Lower Molars of a Fruit-bat (Megachiroptera), for comparison with Insectivorous Type

After Andersen, from the Catalogue of Chiroptera published by the Trustees of the British Museum

Habits. The fruit-bats generally associate in large numbers, and, failing a suitable cave, select trees in some secluded gully, where they roost in colonies or camps during the daytime. Here they hang from the branches, suspended by their hind-claws, looking like gigantic cocoons (Fig. 2). They become restless toward sunset and fly off, their powerful flight enabling them to travel far and wide in search of 'fruit in season.' At break of dawn they come stealing back from all quarters, when, being viciously bad-tempered and quarrelsome, they wrangle and contend with one another for possession of the higher and better branches. If there are too many for the branches they will cling to one another, their weight often breaking down a branch.

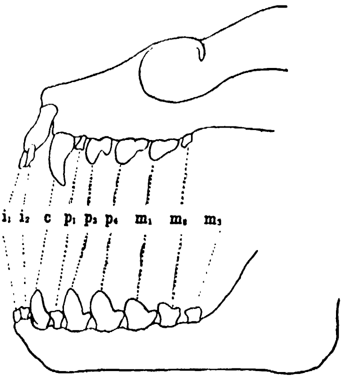


Diagram illustrating the Maximum Number of Teeth occurring in the Living Fruit-bats (Megachiroptera)

i, incisor; *c*, canine; *p*, premolar; *m*, molar. Comparison of the tooth-formula of any fruit-bat genus with this diagram will indicate the position of the various teeth, and show which are lacking.

The bats of the genus *Pteropus* form one of the greatest pests with which orchardists have to contend, the amount of injury done by a flock in a single night being enormous. In the evening these marauders fly in large flocks to the fig-trees, or orchards where fruit is to be had. There they scream, quarrel, and gorge, often wasting more than they eat, and they are without a redeeming feature so far as man is concerned. They have a peculiar musky odour, especially the northern kinds, which often serves as a guide to their camps. They are also often infected with tiny crab-like parasites; these are really aberrant flies which have lost their wings and now depend upon the bats for transport. The strong thumb-claws afford great assistance in clambering about the branches; when feeding one foot only is used for suspension, or that and one thumb-claw, the fruit to be devoured being held by the other two members. As an instance of their powers of locomotion Dr E. P. Ramsay, writing of *Pt. gouldi*, stated that they habitually crossed at dusk from the mainland to the islands in Torres Strait, returning in the early morning to the scrubs. Of *Pt. conspicillatus* John Macgillivray wrote that, on the occasion on which he met with them, prodigious numbers were flying about in the bright sunshine. The bats, however, are about mainly from sunset to dawn.

The chief diet of fruit-bats is fruit, but they often chew eucalyptus flowers to obtain the honey contained in them. Aborigines often feed upon their flesh, which should be sweet as they are fruit- and honey-eaters, but the characteristic smell and appearance of the creatures are repulsive, and it would require great courage to make the experiment. The blacks are accustomed to light fires around a fruit-bats' camp, the smoke stupefying the sleeping creatures, whereupon they are knocked down with sticks and boomerangs. The teeth are admirably adapted for the smashing up of the pulpy fruits which, with the exception of the blossoms of some plants and occasional insects, form the entire diet of the fruit-bats. In Australia bats appear to migrate to a certain extent, but this would seem to be governed by the food-supply.

No very feasible proposal has yet been made for their destruction or for the protection of orchards. The best method is to organize a series of drives, although this only sends them elsewhere to breed up again, and, even when thousands are killed in this way, others may later come from a long distance. These fruit-bats, or so-called 'fox-bats' or 'flying foxes,' are the largest individuals of the order Chiroptera, and the wing expansion of the largest fruit-bat, the Kalong or Malay fox-bat, attains to five feet.

Reference to Literature on Megachiroptera and Acknowledgments. Except where a special reference is quoted under the names of species of fruit-bats the reference is to Knud Andersen's *Catalogue of Chiroptera in the British Museum*, vol. i, "Megachiroptera," 1912. This masterly work epitomizes previous references, and I wish to acknowledge my indebtedness to both the author and the Trustees of the British Museum, who published the catalogue, and also for an illustration which I have ventured to reproduce. Sincere thanks are also due to my colleagues Mr J. R. Kinghorn, C.M.Z.S., and Mr G. P. Whitley for kindly preparing the line drawings other than the first.

FAMILY PTEROPODIDÆ

The characters of the single family of fruit-bats are similar to those of the sub-order, noted above. The family is divided into two sub-families.

SUB-FAMILY PTEROPODINÆ

Characters. Tongue simple, not highly extensible; fixed to floor of mouth by posterior half, and without unfringed filiform papillæ at its tip.

Key to Genera of Pteropodinæ

A. Two pairs of lower incisors; cheek-teeth $\frac{5}{6}$ on each side. First finger and thumb with claw. Tail absent	*Pteropus*
B. One pair of lower incisors; cheek-teeth $\frac{4}{6}$ on each side. First finger without claw. Tail present .	*Dobsonia*
C. No lower incisors; cheek-teeth $\frac{4}{5}$ on each side. First finger and thumb with claw. Tail present	*Nyctimene*

Genus Pteropus, Brisson

Muzzle long, narrow, and cylindrical. Nostrils projecting by their inner margins, the extremity of the muzzle deeply emarginate between them. Upper lip with a vertical groove in front, bounded laterally by rounded, naked ridges. First

2. GREY-HEADED FRUIT-BATS (*Pteropus poliocephalus*)

A cluster of these bats, looking like cocoons or large dark fruit, is seen clinging to a tree. Photographed near Scone, New South Wales.

Photo J. S. P. Ramsay

3. GREY-HEADED FRUIT-BAT (*Pteropus poliocephalus*), FRONT VIEW

Photo G. C. Clutton

3A. GREY-HEADED FRUIT-BAT (*Pteropus poliocephalus*), BACK VIEW

Photo G. C. Clutton

finger with a distinct claw. Wing-membranes joined to the sides of the back and the base of the second toe. Tail absent. Calcaneum well developed. Fur of the nape of the neck and shoulders differing noticeably from that of the back.

Dentition. $\dfrac{I^1 I^2 \ C \ P^1 P^3 P^4 \ M^1 M^2}{I_1 I_2 \ C \ P_1 P_3 P_4 \ M_1 M_2 M_3} \times 2 = 34.$ (See the diagram on p. 26.)

Grey-headed Fruit-bat

Pteropus poliocephalus, Temminck. Eastern Australian coast regions, from Cape Howe to Cape York.

Fur of head grey, with a yellowish tinge; neck, shoulders, and fore-part of breast reddish yellow; breast from shoulder to shoulder blackish grey; back greyish black, many of the hairs with shining extremities. Fur long, and the upper side of the leg thickly clothed to the ankle. Forearm, about 160 mm. (Figs. 2, 3, and 3a.)

Habits. Strictly nocturnal, they remain suspended from the branches of the larger trees by day, looking like great black fruits, and resort to the orchards by night, where they commit fearful havoc. Their favourite food, however, seems to be the small wild fig; a specimen now in the British Museum was shot while feeding on the blossom of a eucalypt. When disturbed they utter a curious cackling cry.

Dusky Fruit-bat

Pteropus brunneus, Dobson. Only specimen from Percy Island, off north-eastern coast of Australia.

Fur above and beneath dark brown, varied with paler tips to the hairs; mantle russet. Inner margin of ear evenly convex from base to tip; outer margin flatly convex in basal half, almost straight in apical half; tip narrowly rounded off. Fur rather short throughout; the leg clothed above with long dense fur, which becomes gradually shorter and more scattered on the terminal fourth. Forearm, 118 mm.

Note. It might also be found on the adjacent coast of the continent, as " a camp of *Pt. brunneus* " is stated to have been observed, by Mr Broadbent, flying over the Australian coast opposite Percy Island.

GOULD'S FRUIT-BAT

Pteropus gouldi, Peters. Queensland, as far south as Rockhampton, including Torres Strait islands, and the islands off the eastern coast, Northern Territory (Port Essington, Alligator River, Port Darwin, Daly River), North-western Australia (Derby).

General colour intensely black, thinly sprinkled with whitish or buffy hairs; back of head and neck chocolate, sometimes bright yellow in adult males. Ears long, narrow, and pointed, the outer margins flatly concave in upper third, tip rather narrowly rounded off. Thighs clothed with fur both above and below. Forearm, 153–180 mm.

Habits. In North Australia this fruit-bat spends the day in the mangroves or bamboo jungles along the watercourses, assembled in flocks numbering several thousand. A camp is never perfectly quiet; even at midday numbers are flitting about in and around the trees, uttering their hoarse shrieks, the sound heard at a distance being comparable to that of a giant bee-hive; the clamour when the camp is disturbed is deafening. At least one of these camps may be found on any large river in North Australia. At sundown the bats commence travelling, sometimes great distances, to reach some patch where the eucalypts are in blossom, the flowers of these forming their principal food. A large camp on the Victoria River, Northern Territory, was estimated to consist of 32,000 individuals. Young are born in March and April, and in August many females have young of considerable size clinging to their breasts. The fat flesh of the species is considered a great delicacy by the aborigines, despite the strong smell of eucalyptus. Of a pugnacious and irritable temper, a wounded *Pt. gouldi* will sometimes attack the legs of the hunter, and, disturbed in the camps or feeding-grounds, they will exude their odorous excrements on an intruder.

SPECTACLED FRUIT-BAT

Pteropus conspicillatus, Gould. North and North-east Australia and the islands off the coast, and South-east New Guinea and the adjacent islands.

Face and crown of head black, with a ring of pale brownish-yellow fur round each eye forming conspicuous ‘ spectacles ’; back of head, nape, and shoulders pale yellowish; back and entire under surface black, with a few shining yellowish hairs. Ears short, obtusely pointed, abruptly narrowed above. Fur short, scarcely extending on to the forearm and legs. Forearm, 157–181 mm.

Habits. In 1848 John Macgillivray found the species in “ prodigious numbers ” on the wooded slope of a hill on Fitzroy Island, North-east Queensland; many branches were bending under the load of bats, some being suspended by their hind-claws and others scrambling along among the boughs and taking to wing when disturbed; on close approach a strong musky smell and loud incessant chattering became apparent. When wounded these large bats are handled with difficulty, as they bite severely. On such occasions their cry resembles the squalling of a child. In South-east New Guinea this species has been observed feeding on the fruits of fig-trees.

FAINTLY SPECTACLED FRUIT-BAT

Pteropus chrysauchen, Peters. Gilolo group and North-west New Guinea (Dorei).

Closely allied to *Pt. conspicillatus*, but usually without well-defined spectacles, and the dentition is rather stronger. Head (as far back as ears), back, and rump glossy blackish, thinly sprinkled with silvery-white hairs. Breast, belly, and flanks blackish seal-brown, mixed with coarse, crinkled, yellowish or greyish hairs. Mantle pale buff to golden ochreous. Circumocular region sometimes washed with paler colour. Fur very short, and closely adpressed on back. Forearm and leg naked above and beneath. Forearm, 175–180 mm.

Note. Undoubtedly a western representative of *Pt. con-*

spicillatus, as there would be no difficulty in referring individuals to either form. The most conspicuous character in *conspicillatus*, the pale spectacles, is sometimes more or less distinctly indicated in *chrysauchen*; the geographical line between these two forms in New Guinea is as yet unknown, and it appears highly probable that they will merge into one another in some intermediate region of New Guinea.

COLLARED FRUIT-BAT

Pteropus scapulatus, Peters. North and North-east Australia, from Thursday Island southward at least to Rockhampton in Northern Queensland, Arnhem Land, Kimberley division, Western Australia.

General colour of fur reddish or yellowish brown, with a much paler collar round the neck; adult males with a light buff-coloured tuft of rigid glandular hairs on each shoulder; back and under surfaces dark reddish brown. Leg naked above and below, excepting immediately below knee. Hair on under side of membranes pale straw-colour, and unusually long and dense, contrasting with dark under side of body. Readily distinguished from any other known species of the genus by the combination of these two characters. Cheek-teeth excessively narrow, the breadth of P^4 being $\frac{1}{5}$ to $\frac{1}{6}$ that of the palate breadth between the two P^4. Ears long and pointed. Forearm, 131–143 mm.

Note. In some specimens an ill-defined spinal stripe divides the mantle into a right and left half or 'shoulder-patch,' probably inspiring the name *scapulatus*.

Pteropus epularius, Ramsay. As yet recorded only from Papua.

Blackish above and beneath, with strongly contrasting buffy mantle. Glandular neck-tufts in males. Ears long, with the tip sub-acutely pointed. Knee and leg naked except for a few scattered hairs. Upper premolars sub-squarish. The chief characters are the peculiarly short cheek-teeth with nearly obsolete posterior basal ledges, large eyes, long pointed ears, and light buffy mantle, contrasting with the dark brownish or blackish back and under parts. Forearm, 136–141 mm.

Note. The original description was based on four specimens collected by Mr G. Masters at Katow, British New Guinea, where the species was found in large numbers clustering on the leaves of a Nipa palm overhanging the water, the discovery being due to the fetid odour pervading the place. Once considered identical with *Pt. macrotis* of the Aru Islands, it has lately been kept separate because of its larger size.

Pteropus hypomelanus hypomelanus, Temminck. Indo- and Austro-Malayan archipelagos, west to Siam and Mergui Archipelago. For restricted localities see subspecies below.

Back varying shades of brown; mantle and under parts varying from pale buffy to seal brown. Ears moderate, broad, exposed, the tip rounded off. Males without glandular neck-tufts. Never blackish above and beneath, and never with a sharply contrasting light yellowish mantle. Posterior edge of P^3, P^4, and P_3 short, but distinctly marked off from the tooth. Size below medium; forearm, 121–145 mm.

Note. The following two sub-species have been described from the New Guinea area:

Pteropus hypomelanus luteus, K. Andersen. New Guinea, Dampier Island, Trobriand group, Woodlark Island.

The palest race of the species; back, rump, and flanks seal brown to Mars brown; head, mantle, and under surface ochreous buff to cream buff. Tibia naked above. Forearm, 128·5–135·5 mm.

Note. The extreme eastern representative of the twelve geographical races of *Pt. hypomelanus*.

Pteropus hypomelanus vulcanius, Thomas. Vulcan (= Manumudar) Island, North-east New Guinea. *Ann. Mag. Nat. Hist.*, (8) xv, 1915, p. 388.

Evidently most nearly allied to *Pt. h. luteus*, this subspecies is readily distinguishable by its much darker chest and belly, which contrasts strongly with the colour of the neck, instead of nearly agreeing with it. Top of head dull buffy, with an intermixture of shining buffy hairs, this colour passing into the darker buffy or ochreous buffy of the nape; back abruptly brown, lined and rendered more greyish by an intermixture of light buffy or whitish hairs; cheeks darker than crown; between lower jaws smoky brown; throat dull buffy, browner in the middle line; sides of neck deep buffy like nape; chest and belly dark olive brown, washed with buffy or dull whitish. Forearm, about 130 mm.; greatest length of skull, 66 mm.

Pteropus basiliscus, Thomas. Dampier Island, off the north-east coast of New Guinea, from which the island is separated by Basilisk Strait. *Ann. Mag. Nat. Hist.*, (8) xv, 1915, p. 387.

Colour of head above pale greyish brown, passing gradually into the ochreous-buffy mantle; back seal brown, mixed with greyish-white hairs; chin and between lower jaws blackish brown; sides of neck dull ochreous buffy; abdomen blackish brown, liberally mixed with shining whitish hairs. Ears moderate, broad, tips rounded off. Fur short, adpressed. Tibia naked above. Forearm: type, 142 mm.; other specimens, 136 and 141 mm. Skull, greatest length, 65·6 mm.

Note. The south-westernmost representative of the *Pt. mariannus* group,[1] the members of which are distinguished by being blackish above and beneath, often sprinkled with pale greyish, and with sharply contrasting light yellowish mantles.

Pteropus papuanus, Peters and Doria. New Guinea, generally distributed.

Fur of back extremely short, in adults restricted to a narrow spinal stripe (least width $\frac{5}{8}$ in.) between the lines of insertion of the wing-membranes. Back vandyke brown, under parts dark ochreous buffy; mantle buff yellow and well defined. Ears short, somewhat attenuated above, narrowly pointed at tips. Males without glandular neck-tufts. Cheek-teeth short and without posterior basal ledges. Size very large; forearm, about 190 mm.

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[1] *Cat. Chiroptera Brit. Mus.*, 1912, p. 172.

Note. Differs from all others of the genus dealt with here in the combination of these two characters: cheek-teeth without posterior basal ledges, furred area of back confined to spinal tract.

The only character distinguishing this species from *Pt. neohibernicus* of the Bismarck Archipelago is the darker colour of its back; should a large series of *papuanus* exhibit a wide range of colour-variation, as indicated by specimens recently secured, the species will have to be definitely regarded as a synonym of *neohibernicus*.

Genus Dobsonia, Palmer

Ears pointed. Wing-membranes perfectly continuous across the back, and connected with the integument of the back only along the spinal line. No claw on first finger. Tail present. Upper incisors between, not in front of, canines.

Dentition.

$$\frac{I^2\ \ C\ \ \ \ P^3\,P^4\ \ M^1\,M^2}{I_2\ \ C\ \ P_1\,P_3\,P_4\ \ M_1\,M_2\,M_3} \times 2 = 28.$$

I_2 rudimentary, sometimes deciduous; P_1, M_3, and M^2 much reduced in size.

Note. The bats of this genus are said to hide in caves, rarely in trees; they have been found in rock-shelters on the coast at sea-level, and in caves in coral limestone.

Key to Species of Dobsonia

A. Smallest of genus; forearm about 80 mm. Premolars and molars simple; no well-marked antero-internal and posterior basal ledges; no surface ridges . . *D. minor*

AA. Much larger; forearm about 146–152 mm. Some premolars and molars with well-marked antero-internal and posterior basal ledges; a median surface ridge at least in M^1 and M_2 . . . . . *D. moluccensis magna*

Dobsonia minor, Dobson. North-west New Guinea (Amberbaki), South-west Dutch New Guinea (Mimika River).

Colour of the Mimika River specimen: head and back of neck brownish drab, with pale drab (fawn drab) bases to the hairs; under side pale fawn drab, tinged with dull tawny olive in a small patch at centre of breast and belly. External characters essentially typical of the genus. Ears distinctly attenuated above, rather less abruptly so than in other species. Tibia conspicuously shorter than usual, only about $\frac{1}{4}$ longer than hind-foot with claws. The species characterized by the simple cheek-teeth and small size. Forearm, about 80 mm.

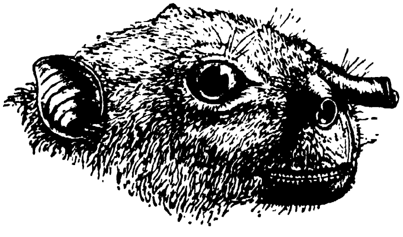
Dobsonia moluccensis magna, Thomas. Generally distributed in New Guinea.

Back of neck bistre, darkest in centre, palest on sides of neck, and shading to shining blackish bistre on head; under parts warm drab, mixed with raw umber and light tawny olive on the middle of breast and belly; hairs on under side of membranes light tawny olive. Much larger than *minor*; forearm, about 146–152 mm.

Genus Nyctimene, Borkhausen

TUBE-NOSED BATS

At once distinguished from all other fruit-bats by the production of the nostrils into a pair of long, diverging tubes, reaching rather beyond the extremity of the muzzle (see illustration). No other known bat has four circumvallate papillæ at the tongue-base — two large papillæ, with two smaller ones behind. It is the only genus of fruit-bats combining these two dental characters—incisors $\frac{1.1}{0\,0}$, cheek-teeth $\frac{4}{5}$—or these two external characters—sharply defined yellow wing-spots, tail present.



HEAD OF A TUBE-NOSED FRUIT-BAT (*Nyctimene*), SHOWING THE TYPICAL NOSTRILS
From a photo by G. C. Clutton

The wings are always spotted with yellow, the spots at first glance appearing as if the outer skin had been removed, leaving a paler under surface. First finger with a claw. Muzzle short, and unusually deep anteriorly. Centre of eye equidistant from ear-base and muzzle-tip. Ears rather short, and triangularly rounded off at tips. A well-marked dark brown spinal stripe usually characterizes the species, but is obsolescent in a few.

Dentition. $$\frac{I^1\ C\ P^1\ P^3\ P^4\ M^1}{C\ P_1\ P_3\ P_4\ M_1\ M_2} \times 2 = 24.$$

Note. The bats of this genus are stated to be partly, if not entirely, insectivorous. The stomach of one species was found to contain exclusively fragments of beetles and flies. The purpose served by the peculiar cylindrical nasal tubes of these animals is so far unknown.

N. cephalotes has hitherto been recorded in Australian works as the only member of this genus occurring in Australia, but this is incorrect; *N. cephalotes* does not occur in New Guinea or Australia, though several other species do.

Key to Species of Nyctimene

A. Dorsal stripe narrow, not nearly ⅓ of breadth of furred area of back

B. Small; forearm, 53–59 mm. C–M^1 (crowns), 9·2–10·3 mm.

C. M^1 sub-equal in size to P^4. Ears unmodified . . . . *N. papuanus*

CC. M^1 noticeably smaller than P^4. Ears unusually broad

D. Forearm, about 53 mm. Cheek-teeth narrow; breadth of P^3, 1·7 mm.; C–M^1 (crowns), 9·2 mm. North-west Dutch New Guinea . . . . *N. cyclotis*

DD. Forearm, about 58 mm. Cheek-teeth broader; breadth of P^3, 2·1 mm.;

C-M^1 (crowns), 9·8 mm. South-east New Guinea . *N. certans*

BB. Medium or large; forearm, 65–77 mm. C–M^1 (crowns), 10·7–14·2 mm.

  E. Ear conspicuously shorter than hind-foot with claws. Hairs of back seal brown at base . . *N. geminus*

  EE. Ear equal (within 1 mm.) to length of hind-foot with claws. Hairs of back of uniform colour from base to tip

    F. Smaller; tibia, 24·5 mm. Ear more acutely pointed. Fur of back brownish . *N. robinsoni*

    FF. Larger; tibia, 28 mm. Ear smaller and more circular. Fur of back greyish *N. tryoni*

AA. Dorsal stripe very broad, about ⅓ of furred area of back. Forearm, 81·5–84 mm. . *N. œllo*

(*N. celæno* enters this (*AA*) section, but is at present without key characters distinguishing it from *œllo*.)

Nyctimene papuanus, K. Andersen. Queensland, New Guinea, and surrounding islands.

General colour of back dark wood brown, distinctly tinged with fawn; nape of neck and dorsal surface of head similar, but rather darker; colour of back not distinctly mottled, with dark brownish tips to the hairs; spinal stripe sharply defined, nearly seal brown; centre of breast and belly yellowish white; fore-neck, sides of breast, belly, and flanks ochreous cinnamon. Ears triangularly rounded off above. Membranes usually from second toe. M^1 sub-equal in size to P^4. Size small; forearm, 54·5–59 mm.

Nyctimene cyclotis, K. Andersen. The only specimen known is from the Arfak Mountains, North-west New Guinea.

General colour of back light greyish wood brown, irregularly mottled with dark brown tips to the hairs; spinal stripe narrow, seal brown, confined to posterior half of back; neck similar to back, but paler; centre of breast and belly dull cream. Ears unusually broad, nearly as broad as long, and semicircularly rounded off above. Membranes from second toe. Premolars and molars peculiarly short and broad; M_1, reduced to about $\frac{2}{3}$ or $\frac{3}{4}$ the size of P^4. Size small; forearm, about 53 mm.

Note. The short, rounded cheek-teeth, reduced M^1 and M_1, and unusually broad ears, nearly as broad as long, at once distinguish this species and the following *certans* from all others of the genus.

Nyctimene certans, K. Andersen. Aroa River, Papua, Mount Goliath, South-east Dutch New Guinea.

Peculiarly mottled above as in *cyclotis*, but the colour is much darker. Individual hairs of back seal brown from the base up to about 5 mm., then very pale wood brown for 5–6 mm., with short 2-mm. dark brown tips; the mottled appearance of the colour of the head and back is due to the dark brown hair-tips being too short to cover completely the paler middle portion of the hairs. A narrow, somewhat ill-defined dark brown spinal stripe along the posterior half of the back; breast and belly pale greyish drab in centre; flanks fawn. Ears as in *cyclotis*, and also narrowly edged all round with yellow, this yellow edging being interrupted occasionally by the dark central colour of the conch extending to the ear-margin. Molar teeth sub-circular in outline, and with the upper and lower M^1 conspicuously smaller than the upper and lower P^4, as in *cyclotis*; but *certans* has all the cheek-teeth much heavier, and particularly broader, than in *cyclotis*. Forearm of type, 58 mm.

Note. A south-eastern representative of *cyclotis*, distinguished by its much heavier dentition and the much darker colour of its fur.

Nyctimene geminus, K. Andersen. New Guinea (Huon Gulf), Trobriand and D'Entrecasteaux archipelagos.

General colour of back pale brownish drab, of somewhat warmer tinge along membranes; spinal stripe narrow, well defined, dark seal brown ; individual hairs of back seal brown at base, with lighter tips ; nape of neck greyer, head more inclining to pale wood brown ; chest, breast, and middle of belly pale raw umber or tawny olive, the colour gradually shading into pale fawn brown on flanks and anal region. Ear conspicuously shorter than the hind-foot with claws included, triangularly rounded off above. Forearm, 70·5–77 mm.

Nyctimene robinsoni, Thomas. The only specimens yet recorded are from Cooktown, Queensland.

General colour of back a dark wood-brown tinge of isabelline ; individual hairs uniform brownish from base to tip ; a well-marked, narrow, seal-brown spinal stripe along the whole back ; under parts pale isabelline tinged with tawny olive along the middle line from throat to belly ; dark russet or cinnamon along flanks and in anal region. Ear large, equal in length to the hind-foot with claws included ; more acutely pointed than in *geminus* or *tryoni*. Smaller than *tryoni* ; forearm, about 66 mm. ; tibia, about 24·5 mm.

Nyctimene tryoni, Longman. Canungra, Macpherson Range, South Queensland. *Mem. Qld. Mus.*, vii, 3, 1921, p. 179, Pl. XII.

General colour above smoke grey ; individual hairs of back uniform greyish from base to tip ; a narrow dark spinal stripe is present ; the prevailing colour of the under surface is fawn, but the tips of the fur give a silver-grey effect ; fur on flanks and proximal third of fore-limbs becoming fulvous. Ears smaller and more circular than in *robinsoni* ; they are evenly rounded off, and the antero-lateral margin is scalloped ; ear about the same length as the hind-foot with claws included. Larger than *robinsoni* ; forearm, 68 mm. ; tibia, 28 mm.

Note. Described from a single specimen, this species is mainly dependent upon slightly larger measurements to distinguish it from its nearest ally, *robinsoni*. Further specimens may prove it to be synonymous or only sub-specifically distinct.

Nyctimene œllo, Thomas. Milne Bay, New Guinea, and Mysol Island.

Distinguished at a glance from all other species of *Nyctimene* (except *celæno*) by its very broad spinal stripe, which is about ⅓ the breadth of the furred area of the back; the seal-brown colour of the stripe strongly contrasts with the general light buffy wood-brown tinge of the back; there is also a narrow dark brown stripe on either side of the back along the membranes; centre of breast and belly pale yellowish; flanks warm tawny cinnamon; paler on chest and sides of neck; pale fawn in anal region. Size large; forearm, 81·5–84 mm.

Nyctimene celæno, Thomas. North New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 262.

The species is imperfectly described at present, and such characters as are given do not distinguish it from *œllo*: "A large species related to *N. œllo*, with similar broad dorsal band, but rather smaller, and of browner coloration. Forearm, 83 mm.; skull, greatest length, 36·5 mm."

Note. Thomas states, before the above 'preliminary' diagnosis, that a full list will in due course appear in *Nova Guinea*. Pending this list there are no characters to be used in key-form to separate this species from *œllo*; the forearm measurements of the two species come within the same range.

SUB-FAMILY MACROGLOSSINÆ

Characters. Tongue highly extensible; fixed to the floor of the mouth by its posterior third, and its terminal fourth or fifth covered above with well-developed, unfringed, filiform papillæ.

Key to Genera of Macroglossinæ

A. Under side of body not darker than the back
  B. Lower incisors sub-equal in height; a wide interspace between both the upper and lower inner incisors . . . *Macroglossus*

BB. Outer lower incisor much higher than inner one; no interspace between the upper or lower inner incisors, which are narrowly spaced or in contact . . *Syconycteris*

AA. Under side of body much darker than the back *Melonycteris*

Genus Macroglossus, F. Cuvier

First finger with claw. External tail rudimentary or absent. Upper incisors minute; lower incisors sub-equal in size.

Dentition. $\frac{I^1\,I^2\;\;C\;\;P^1\,P^3\,P^4\;\;M^1\,M^2}{I_1\,I_2\;\;C\;\;P_1\,P_3\,P_4\;\;M_1\,M_2\,M_3} \times 2 = 34$, but dental anomalies frequently occur.

Note. The only local genus with which this one is likely to be confused is *Syconycteris,* to which it bears considerable resemblance in general appearance and size. From the latter it is readily distinguished by the wide interspace between both the upper and lower inner incisors, which are either narrowly spaced or in contact in *Syconycteris,* also by the very small incisors, the outer ones being sub-equal to, if not smaller than, the inner ones, whereas in *Syconycteris* the incisors are much larger, and the outer ones are about twice the size of the inner ones.

Macroglossus lagochilus lagochilus, Matschie. The whole of Austro-Malaya, extending west to Borneo and the Philippines. For restricted localities see sub-species below.

General colour of back varying from warm russet Prout's brown to almost pure wood brown; head similar to back, or a little deeper; nearly always a distinct, though sometimes poorly defined, darker brown median longitudinal stripe from crown to nape of neck; under parts fawn to whitish wood brown. A sharply defined groove between the nostrils is continued downward to the margin of the upper lip. Membranes usually inserted on the fourth toes, sometimes on the third. Forearm, 37–44·5 mm.

The following two sub-species come within the scope of the regions dealt with :

Macroglossus lagochilus nanus, Matschie. Sunday Island, Western Australia, Mysol Island, Western New Guinea, Admiralty group (Manus Island), Bismarck Archipelago, Aru Islands, ? Kei Islands.

Forearm, 37–39 mm. ; length of rostrum, measured from orbit to nares of skull, 7·5–8·5 mm.

Note. The first record of any species of *Macroglossus* occurring in Australia.

Macroglossus lagochilus pygmæus, K. Andersen. Thus far known only from Murray Island, Torres Strait.

Forearm, 37·5 mm. ; length of rostrum, measured from orbit to nares of skull, relatively a little shorter than in *nanus*, about 6·8 mm.

Genus Syconycteris, Matschie

Similar to *Macroglossus*, but the upper incisors are much larger ; outer lower incisor once and a half to twice the size of the inner ; the remarkable contrast in size between these two lower teeth is sufficient to distinguish *Syconycteris* from all other macroglossine genera. Inner lower incisors narrowly spaced or in contact. Forearm, 39–49 mm.

Dentition. $$\frac{I^1\,I^2\;\;C\;\;P^1\,P^3\,P^4\;\;M^1\,M^2}{I_1\,I_2\;\;C\;\;P_1\,P_3\,P_4\;\;M_1\,M_2\,M_3} \times 2 = 34.$$

Key to Species of Syconycteris

A. Cheek-teeth elongate in transverse section ; upper and lower P^4 and M^1 decidedly more than half as broad as long . . . . *S. crassa*

AA. Cheek-teeth narrower ; upper and lower P^4 and M^1 only half as broad as long . . . . *S. australis*

Syconycteris crassa crassa, Thomas. New Guinea group, except Woodlark Island, Amboina group.

General colour of the back cinnamon wood brown, shading into a darker tinge of brown on the shoulders, the sides along the membrane, and on the crown. Under parts wood brown, rather thickly mixed with light greyish hairs on the centre of the throat, breast, and belly.

The broader, more elongate form of the premolars, as shown in the above key, is the only character distinguishing this species from *S. australis*.

Note. Only one of the five sub-species of *crassa* occurs in the regions dealt with:

Syconycteris crassa papuana, Matschie. British and Dutch New Guinea, Aru Islands.

Forearm, 40–44 mm.; length of upper tooth-row, canines to M^2, measured along crowns, 7·6–8·8 mm.

Little Fruit-bat

Syconycteris australis, Peters. Queensland (Rockhampton and Mackay).

Fur reddish brown, unusually long for the sub-family. The narrower, less elongate form of the premolars and molars, as shown in the above key, is the only character distinguishing this species from *S. crassa*. Forearm, 39–40·5 mm.

Note. Though of such small size, this bat is said to be very destructive to fruit. It has often been incorrectly stated to occur in West Australia.

Genus Melonycteris, Dobson

This genus, represented by a single species, is distinguished from all others of the sub-family Macroglossinæ by having the under side of the body much darker than the back. Naked portion of upper lip, beneath nostrils, reduced to a narrow raised edge on either side of the median vertical groove. First finger with a claw. Tail absent.

$$\textit{Dentition.}\ \frac{I^1\, I^2\ \ C\ \ P^1\, P^3\, P^4\ \ M^1\, M^2}{I_1\, I_2 .\, C\ \ P_1\, P_3\, P_4\ \ M_1\, M_2\, M_3} \times 2 = 34.$$

Melonycteris melanops, Dobson. New Guinea (MacCluer Bay), Bismarck Archipelago.

General colour of back pale cinnamon; a small epaulette of white in front of the arm at the origin of the membrane; crown dark brown, lightened with cinnamon; under parts, from throat backward, seal brown, heavily mixed with light grey; sides of face and round the eyes seal brown, finely sprinkled with pale cinnamon; extremity of hairy muzzle and a narrow streak continued backward between the eyes light greyish or buffy grey; forearm and digits (dried) yellowish, irregularly blotched with dark brown; membranes dark brown, with some irregular and ill-defined yellow patches between the forearm and base of the last digit. Forearm, 57·5–63 mm.

SUB-ORDER MICROCHIROPTERA

Small Insect-eating Bats

Characters. Face usually broad and short; the muzzle or nostrils with or without leaf-like folds of skin. Ears with the inner and outer sides not meeting at the base, most being provided with special lobes, including a kind of secondary

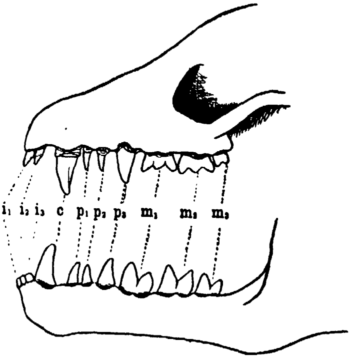


Diagram illustrating the Maximum Number of Teeth known to occur in the Order Chiroptera, found in the Genera *Myotis*, *Kerivoula*, and *Phoniscus*

Comparison of the tooth-formula of any genus of the Microchiroptera with this diagram will indicate the position of the various teeth and show which are lacking in lesser formulæ.

inner ear known as the tragus (see diagram on p. 50), which is absent in the Rhinolophidæ and Hipposideridæ only. Crowns of the molars or back teeth with sharp cusps or points; in the upper jaw these cusps are in the form of the letter 'W,' and the molars have their longest diameter from side to side. Thumb only armed with a claw. Tail present and of considerable length; it is contained within the inter-thigh membrane, which joins the hind-limbs, either perforating its upper surface or projecting beyond the membrane's hind-edge.

Note. Most insectivorous bats are of smaller size than the fruit-bats, and in consequence are known as the Microchiroptera, or "little bats." They inhabit almost all parts of the world, one species at least even extending as far north as the Arctic Circle, but they are most abundant in the tropical regions. Usually these small bats can be quickly distinguished from fruit-bats by their short, flattened, wizened-looking faces and small eyes. There are over one thousand forms recognized, and so many in and around Australia that it is possible to deal only with those of the mainland of Australia, of Tasmania, and of New Guinea.

Though able to fly in broad daylight, they rarely appear before sunset, and are mainly nocturnal, slipping stealthily into the dusk from caves, hollow limbs, or even from under the curled-up bark of dead trees.

As evidence of the way in which the little bats will congregate in odd places, when some dead bamboos were cut down in the Botanical Gardens of Singapore twenty-six bats, adult and young, were found enclosed in a joint of bamboo a foot long, with a hollow two inches in diameter. The only entrance was by a triangular aperture a quarter of an inch across in its widest part, and, according to Mr Oldfield Thomas, it was the exceedingly flattened skull of the particular species which enabled the bats to get through so small an aperture. Another unusual hiding-place for bats was observed by Mr A. F. Bassett Hull while at Ourimbah, New South Wales, some years ago; he was examining a nest of the white-browed scrub wren, *S. frontalis*, when five small bats were observed to fly from the nest, which was placed among flood *débris* near the roadside by Ourimbah Creek. On another occasion Mr J. S. P. Ramsay startled about five bats, apparently adults, which flew out of the nest of a yellow-throated scrub wren, *S. citreogularis* ; this nest was pulled down in November some years ago from about nine feet above a little stream flowing into the Ourimbah Creek. While collecting on Eyre's Peninsula, South Australia, recently I collected two species of bats under the loose, curled sheets of the bark of dead 'she-oaks' (*Casuarina*).

In the insectivorous bats the senses of touch and hearing are marvellously developed, as, being mostly twilight- or night-flying, and with relatively small eyes, it is obvious that they must be provided with some special means of avoiding objects during flight. It was demonstrated as early as 1793 by the cruel experiment of depriving bats of their sight, and later by the kindlier method of covering their closed lids with wax, that bats, in some mysterious way, probably by vibrations set up in the atmosphere, are aware of the proximity of objects. With their eyes entirely covered bats have been allowed to fly in rooms across which silk threads have been stretched with just room between for the outstretched wings to pass; in no case were the threads touched, even when placed so close together that the bats were obliged to contract their wings; they also successfully avoided striking each other, as well as walls, ceiling, furniture, and twigs and leaves, and suspended themselves by their legs to any object as efficiently as when possessing sight.

It is believed that in most of the bats this acute sense is situated in the wing-membranes, which are literally a mass of nerves, and in the delicate and often extremely large ears. Many species of bats have also curious expansions of skin on the face, usually called the 'nose-leaf' (Fig. 4); in some this facial membrane is small, but in others large and complicated. These nose-leaves are always fringed round with delicate hairs (Fig. 4A), which have exceedingly sensitive nerves attached to their roots, and which apparently correspond to the whiskers of cats.

It has been suggested that sight and touch are the means used by bats in avoiding obstacles, but experiment has proved that they can do without the former, and, regarding the latter, it seems impossible that a bat could fly at, touch, and then avoid collision with an object. The latest and most likely hypothesis is advanced by Dr H. Hartridge; during flight bats are known to emit short wave-length sounds, and he suggests that these sounds are reflected from objects in the vicinity, the reflections being received by the bats' sensitive ears and nose-leaves and giving them information concerning their surroundings; the bats thus receive a sensory warning, and are able to divert their flight. In support of this it is notable that those species which seek the darkest retreats in daytime and fly the latest at night are furnished with large and sensitive ear-membranes and nose-leaves as well; those kinds which do not possess nose-leaves or very sensitive ears issue forth only in the early evening, at dawn, or in the moonlight. If eyesight were the most essential sense of bats the eyes would have become exceptionally large and convex as in other nocturnal animals, instead of the nerves in other parts becoming highly developed. Nevertheless, the tiny eyes of bats can see, and the phrase 'blind as a bat' is not a very apt one, for it is almost certain that it is partly by sight that bats are enabled to catch their tiny prey while flying rapidly in almost total darkness. The fruit-bats do not possess nose-leaves or large and complex ears, but in their case the eyes are large and specially adapted for seeing at night, and they are inclined to move about earlier than the small bats.

When on the wing ordinary insect-eating bats utter a short, sharp squeak; as the notes of any creature are always best adapted to its own and its fellows' hearing, it may be assumed that in these bats hearing is attuned to sounds of a much higher pitch than that of our own and of most animals. It has been noted that bats in captivity are not disturbed by thunder or people's voices, but immediately start and display uneasiness at high-pitched piano-notes, chirruping sounds, or the tearing of paper.

Elsewhere many insectivorous bats are known to hibernate, but whether all species do so in Australia is not known; it would appear that considerable numbers do hibernate in Australia, as there is a period in the winter when bats are not heard or seen, and when insects are very scarce; there are instances noted when bats have been found in their hiding-places cold and incapable of crawling or flying, but when warmed have regained their summer vigour; when handled they attempted to bite, and when thrown into the air could fly away. Those species in temperate regions which do not hibernate undertake migrations in certain directions which are doubtless governed by food-supply and warmth.

Insectivorous bats usually have one young one, but frequently give birth to twins. The young one clings tightly to the parent's bosom with its feet and clawed thumbs; it also usually has one of the mother's teats in its mouth. By these means the young one clings closely, and never leaves its mother until almost full-grown. It is not generally realized that bats possess powers of flight superior to those of many birds, which may be inferred from the fact that a small bat has been known to catch flies in the air while burdened with young which weighed more than she did. Bats have been kept alive in captivity for considerable periods, during which their main diet was the larvæ of the common meal-beetle (*T. monitor*), of which they can eat large quantities at a time; one small bat ate an average of about seven dozen meal-worms a day, the equivalent of about a quarter of an ounce of food.

The insectivorous bats of all species are of the greatest possible service to man, and rank with the most useful of his animal friends, beginning their work where the day birds leave off; their diet consists almost entirely of nocturnal winged insects, which issue forth in vast numbers during the early evening and night in quest of their mates. The sharp-pointed cusps on the molars of insect-eating bats are admirably adapted for piercing and tearing the hard cases of beetles and other winged insects, and the moment the insect-eating birds retire to roost the bats take their place in preserving the balance of nature, so that insects, under normal conditions, do not become a plague.

To kill an insectivorous bat is a positive crime, yet many do so for amusement, and if by accident one flies into a room there is an instant rush to kill or maim the useful and harmless creature. As all the species of Microchiroptera are of the greatest economic help to man, none should be wantonly killed under any circumstances, the only excuse for doing so being to obtain museum specimens of these quaint, highly specialized little allies of man.

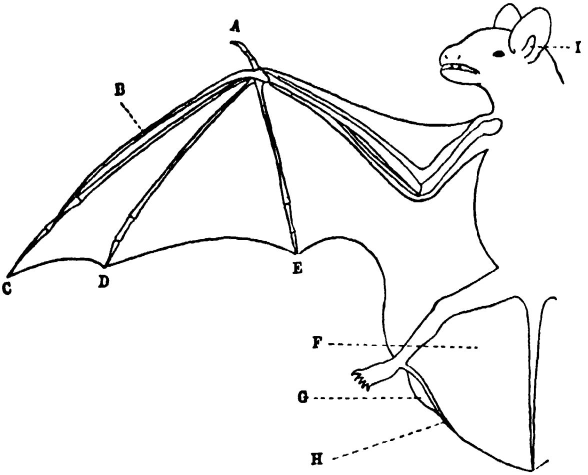


Diagram illustrating the Main External Characters of an Insectivorous Bat (Microchiroptera)

A, hooked thumb; *B* to *E*, first to fourth digits or fingers; *F*, inter-thigh membrane; *G*, post-calcaneal lobe; *H*, calcaneum; *I*, tragus.

Principally insectivorous, the small bats are occasionally but rarely fruit-eaters; in Australia and New Guinea they are never blood-suckers.

Owing to the scanty nature of many overseas descriptions, and to the fact that so few European authors ever illustrate the species they describe, I regret that it is impossible to give keys or illustrations to many species. The references quoted are not necessarily the earliest, but those best calculated to assist the reader.

Where an old-established scientific name of a species has recently been altered, to assist the reader the old name is sometimes quoted in brackets after the name accepted at present.

Key to Families of Microchiroptera

- *A*. Tragus absent
  - *B*. Toes (except first) with three phalanges each . . . . . . *Rhinolophidæ*
  - *BB*. Toes with two phalanges each . . *Hipposideridæ*
- *AA*. Tragus present
  - *C*. Tragus bifid . . . . . . *Megadermidæ*
  - *CC*. Tragus not bifid
    - *D*. Tail not extending to the edge of the inter-thigh membrane, but perforating it and appearing on its upper surface . . *Emballonuridæ*
    - *DD*. Tail extending to edge of inter-thigh membrane
      - *E*. Tail extending to the hinder edge of the membrane, but never much beyond it; membrane not movable on the tail *Vespertilionidæ*
      - *EE*. Tail thick, projecting far beyond the hinder margin of the membrane, which is movable upon the tail . . . *Molossidæ*

FAMILY RHINOLOPHIDÆ

Horseshoe Bats

Ears large, generally separated, without tragi. The leaf-like cutaneous folds which surround the nostrils on the upper part of the muzzle are strongly developed, two folds in front being grouped like a horseshoe; the upper or hinder part of the nose-leaf is elongated to a point. First toe with two phalanges; others with three each. Tail produced to the hinder margin of the inter-thigh membrane.

Genus Rhinolophus, Lacépède

Characters of the single genus as in the family. Nose-leaf very complex, consisting of three distinct portions: the front lower portion horizontal, horseshoe-shaped, and notched in front, the middle flattened in front and sending out a vertically compressed process, the hind-part triangular.

Dentition. $I\frac{1-1}{4}$, $C\frac{1-1}{1-1}$, $P\frac{2-2}{3-3}$, $M\frac{3-3}{3-3} = 32.$

Horseshoe Bat

Rhinolophus megaphyllus, Gray. North-east Australia, Queensland, New South Wales (Richmond and Clarence Rivers). *Cat. Chiroptera Brit. Mus.*, 1878, p. 110.

Horseshoe greatly developed, concealing the muzzle. Lower lip with three grooves. Fur pale mouse colour. Inter-thigh membrane square behind, or slightly convex. Forearm, not quite 51 mm.; horseshoe breadth, 9·8 mm.; head and body, about 51 mm.; tail, about 25 mm.

Broad-leafed Horseshoe Bat

Rhinolophus fallax, K. Andersen. Kemp-Welch River, Papua. *Ann. Mus. Civ. Genova,* (3) ii, 1905, p. 173, Pl. III, Figs. 1–7.

The front or horseshoe part of the nose-leaf markedly broader (see Fig. 4) than in *R. megaphyllus*; no tooth-like projection on either side of the middle notch; supplementary leaflet almost completely covered by the margins of the horseshoe. Posterior margin of the inter-thigh membrane somewhat concave owing to the shortness of the tail, which is a little longer than the lower leg. Forearm, 48·5 mm.; horseshoe breadth, 10·5 mm.; tail, 23·8 mm.

Note. The only species of the genus known from New Guinea; a single specimen was taken in the above locality. The author omits any reference to colour.

FAMILY HIPPOSIDERIDÆ

Leaf-nosed Bats

Each toe with two phalanges. Other characters as in Rhinolophidæ, excepting that the upper or hinder portion of the nose-leaf does not terminate in a point, and the front portion is not definitely horseshoe-shaped.

Key to Genera of Hipposideridæ

A.	One upper premolar ; upper canine with a large secondary cusp behind. Nose-leaf deeply notched in front	*Rhinonycteris*
AA.	Two upper premolars ; upper canine simple, without very conspicuous cusps. Nose-leaf without a notch in front	*Hipposideros*

Genus Rhinonycteris, Gray

Nose-leaf triangular-sided in front, the horizontal membrane consisting of two layers, the upper one deeply notched in front. There is only one upper premolar on each side, but each upper canine tooth has a large secondary cusp rising to the middle of the rear side of the shaft.

Dentition. $\mathrm{I}\frac{1-1}{4}, \mathrm{C}\frac{1-1}{1-1}, \mathrm{P}\frac{1-1}{2-2}, \mathrm{M}\frac{3-3}{3-3} = 28.$

ORANGE HORSESHOE BAT

Rhinonycteris aurantia, Gray. North and North-west Australia, especially abundant in the Coburg Peninsula. *Cat. Chiroptera Brit. Mus.*, 1878, p. 126, Pl. VIII, Fig. 2.

Fur soft ; bright orange in the male, pale yellow in the female. Forearm, 47 mm. ; head and body, about 50 mm. ; tail, about 26 mm. In the day it retires to the hollow spouts and holes in gum-trees.

Genus Hipposideros, Gray

Front part of nose-leaf not definitely horseshoe-shaped like that of *Rhinolophus*, and without a notch in the front margin. There are two upper premolars on each side. The upper canines are heavy but simple, being without conspicuous ledges, though frequently with a secondary cusp near the hinder base of the shaft.

Dentition. $I\frac{1-1}{4},\ C\frac{1-1}{1-1},\ P\frac{2-2}{2-2},\ M\frac{3-3}{3-3} = 30.$

FAWN-COLOURED HORSESHOE BAT

Hipposideros cervinus, Gould. Australia (Albany Islands, Cape York), New Guinea, Aru Islands, Waigiu Islands, Solomon Islands. *Cat. Chiroptera Brit. Mus.*, 1878, p. 142, Pl. IX, Fig. 7.

Fur reddish brown, darkest above. Ears much shorter than the head. Nose-leaf much narrowed in front of the nasal apertures and with two extra secondary leaflets. Inter-thigh membrane of moderate size, triangular. Forearm, about 45 mm.; head and body, about 51 mm.; tail, about 26 mm.

BROWN HORSESHOE BAT

Hipposideros bicolor, Temminck, var. *aruensis*, Gray. Albany Islands, Cape York, Australia, Aru Islands. *Cat. Chiroptera Brit. Mus.*, 1878, p. 150.

Fur above very dark brown, almost black; below greyish brown. Ears moderate, about equal in length to the head. Front part of nose-leaf small and square, scarcely as wide as the transverse terminal leaf; no secondary leaflets. Inter-thigh membrane slightly angular behind. Forearm, about 38 mm.; head and body, about 45 mm.; tail, about 25 mm.

Hipposideros semoni, Matschie. Cooktown, Queensland. *Denk. med. Nat. Ges. Jena*, viii (Semon's *Forschungsreisen*, v), 1903, p. 774.

Fur of the back brown; under surface grey brown; the wing-membranes, near the sides of the body, are covered with whitish-brown hairs. Ears long, somewhat longer than the head, wide apart and tapering off acutely at their tips. A slender, club-shaped process, 14 mm. long, projects vertically upward from the centre of the hindermost margin of the nose-leaf. From about the centre of the entire nose-leaf there is a long process about 20 mm. long projecting forward. On either side of the front of the nose-leaf the folds are double. Forearm, 47 mm.; tail, 23 mm.

Hipposideros stenotis, Thomas. Type from Mary River, Northern Territory. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 206.

Allied to *semoni*, but smaller, with conspicuously smaller skull and teeth. Externally much as in *semoni*, the wart or process in the centre of the nose-leaf similarly elongate. Ears equally, or even more, narrowed and pointed. Hindmost part of nose-leaf with its convexity behind not developed into a supplementary leaf. The author omits colour. Forearm, 43·5 mm.; head and body, 45 mm.

Hipposideros diadema diadema, Geoffroy. Extending from India to Aru Islands. *Cat. Chiroptera Brit. Mus.*, 1878, p. 137, Pl. IX, Fig. 4.

Fur above pale shining buff for two-thirds the length of the hairs, the remaining portion chocolate or reddish brown, with grey tips; upper part of body anteriorly light, posteriorly dark coloured; beneath light greyish or buffy brown. The hinder, erect nose-leaf equals the front leaf in width. Sides of the muzzle with three prominent vertical leaves on each side.

Note. One sub-species comes within the range of this work.

Hipposideros diadema pullatus, K. Andersen. Papua (Haveri and Chad's Bay). *Ann. Mag. Nat. Hist.*, (7) xvi, 1905, p. 498.

In this, the only form of the species occurring in New Guinea, the back is darker, approaching seal brown; there is no contrast between the anterior and posterior parts of the back. There are two strongly marked, round, whitish or yellowish patches on each side in the shoulder region, one behind the other and close together; a longitudinal stripe of the same colour borders each side of the back along the membranes. Forearm, 75·5–81 mm.

Hipposideros muscina, Thomas and Doria. Fly River, near Central New Guinea. *Ann. Mus. Civ. Genova*, (2) iv, 1886, pp. 201–4 and figure.

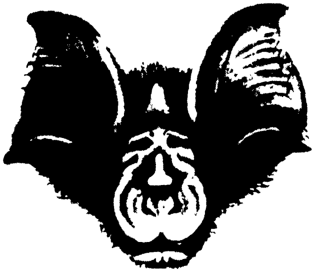
Like *cervinus*, but more massive. Colour much darker than that of *cervinus*; the colour above and below is smoky brown, though some are a little lighter. The ears are large; pressed forward they reach to the extremity of the snout; the tips are sharply pointed. Nose-leaf (Fig. 4A) much larger and more complicated than in *cervinus*, and the two secondary leaflets on each side of the front leaf are longer. Forearm, 47 mm.; head and body, 52 mm.; tail, 23 mm.; ear, 14 mm.

Hipposideros wollastoni, Thomas. Utakwa River, South-west New Guinea. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, pp. 205–206.

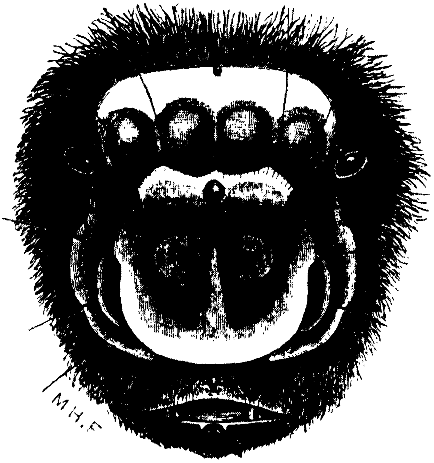
Near *H. muscina*, but with a doubled posterior nose-leaf and more inflated skull muzzle. Ears of the comparatively broad shape which distinguishes *muscina* from the allied Australian species, *semoni* and *stenotis*. The duplication of the posterior part of the nose-leaf consists of a transverse crest growing out at the back of and parallel with the main crest, the groove between the two crests being subdivided into three cells. Forearm, 44 mm.; head and body, 45 mm.; tail, 27 mm.; ear, 15 mm.

Hipposideros papua, Thomas and Doria. New Guinea. *Ann. Mus. Civ. Genova*, (2) iv, 1886, pp. 204–206.

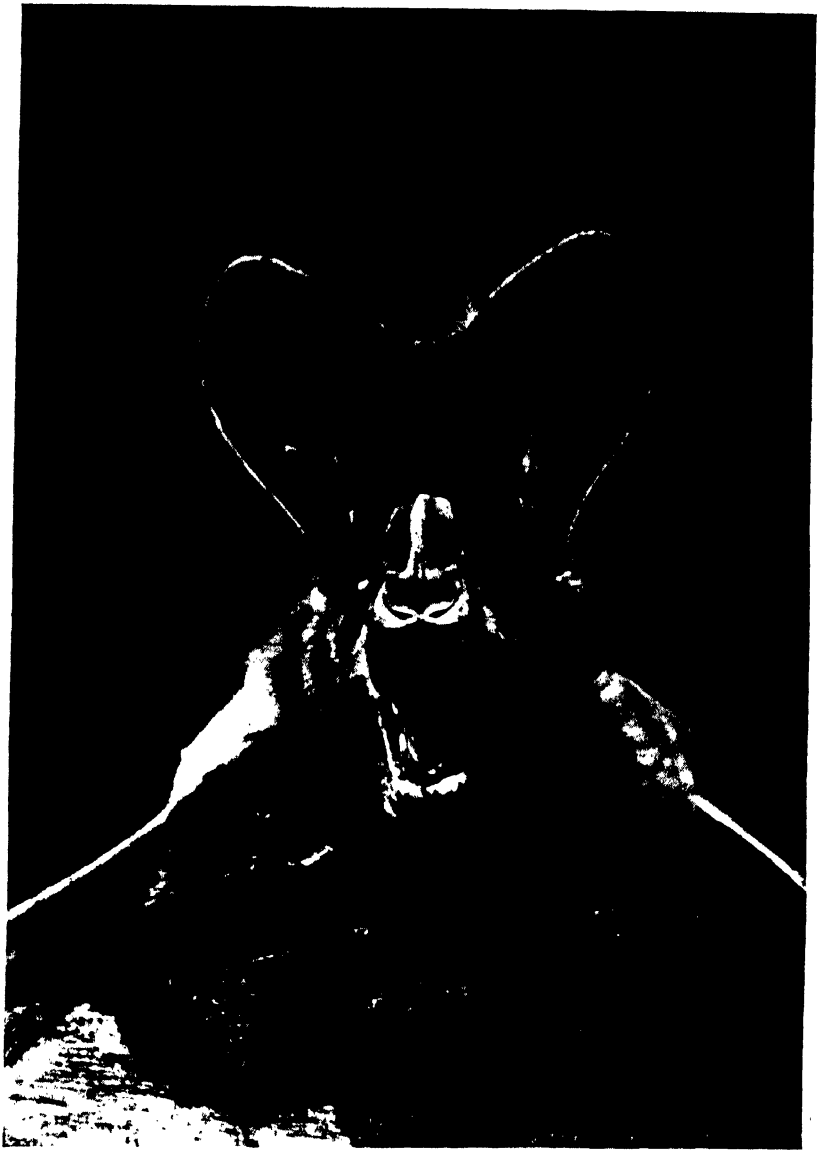
Allied to *cervinus*, but with much larger ears and somewhat greater dimensions. The colour is a little darker than that



4. HEAD OF *Rhinolophus fallax*
Showing ear and nose-leaf structure. See p. 52.
After Andersen



4A. HEAD OF *Hipposideros muscina*
Showing structure of nose-leaf and fringe of long delicate hairs.
After Thomas and Doria



5. AUSTRALIAN FALSE VAMPIRE BAT (*Macroderma*

Collected by the photographer at Olsen's Caves, near Rockhampton, Queensland. Note the divided tragus in the ear, and the absence of upper incisors, giving a toothless expression above; the absence of these teeth has been regarded as a provision for blood-sucking, but, on the contrary, the true vampires of South America have large razor-like upper incisors for shaving away the skin. This species does not suck blood, but is a cannibal, feeding mainly upon smaller bats.

Photo A. Musgrave

of *cervinus*. Ears without the concavity found on the upper third of the internal margin in *cervinus*. The nose-leaf is larger, and the front portion overhangs the tip of the muzzle, whereas it finishes short of the muzzle in the other species; the upper secondary leaflets at the sides of the nose-leaf are also twice as large, and the hind-portion of the nose-leaf is higher, with a more convex upper margin. Forearm, 50 mm.; head and body, 51 mm.; tail, 22 mm.; ear, 12 mm.

Hipposideros cupidus, K. Andersen. Jobi Island, north coast of New Guinea, and Eaga, Papua. *Ann. Mag. Nat. Hist.*, (9) ii, 1918, p. 383.

The author gives a very brief preliminary diagnosis only, and says that this species is closely allied to *H. calcaratus*, which does not occur in Australia or New Guinea. The latter has the following characters: Ears as long as the head, triangular, with obtuse tips. Nose-leaf simple in front; no secondary leaflets on the sides of the muzzle. Calcaneum remarkably long and strong, comparatively more so than in any other species of the genus, exceeding half the tibia in length. Fur long and dense, above dark brown, below orange brown.

Note. I cannot say if all the above characters of *calcaratus* are present in *cupidus*.

FAMILY MEGADERMIDÆ

False Vampire Bats

Ears large, with the tragus long and bifid. Nose-leaf long, erect. Tail very short, discernible only in the skeleton. Upper incisors absent.

Genus Macroderma, Miller

Muzzle cylindrical, elongated. Lower lip projecting beyond the upper. Nostrils in a slight depression near the muzzle extremity, and surrounded by a naked expansion of skin, which forms a vertical process behind. Ears large, partially connected.

Dentition. $I\frac{0-0}{4}$, $C\frac{1-1}{1-1}$, $P\frac{1-1}{2-2}$, $M\frac{3-3}{3-3} = 26$.

AUSTRALIAN FALSE VAMPIRE BAT

Macroderma gigas, Dobson. Central Queensland (Wilson's River), Central Australia, Pilbarra district, North-western Australia. *Proc. Zool. Soc.*, 1880, p. 461, Pl. XLVI.

Terminal third of the fur above pale greyish brown, beneath almost white, as also are the ears, nose-leaf, and membranes. Ears considerably longer than the head, conjoined for nearly half the length of the inner margin, oval and rounded off above; tragus large and bifid, with a long hind- and short fore-branch. Nose-leaf with convex sides, the anterior concave disk large, carrying a vertical process above. Forearm, about 107 mm.; head and body, about 138 mm. (See Fig. 5.)

Note. This species, the only member of the family Megadermidæ occurring in Australasia, is said to feed not only upon insects, but also on smaller bats and other small mammals, and even on frogs, fishes, and small birds. It is also said to be a blood-sucker, some authors suggesting that the absence of upper incisors and the shape of the mouth are adaptations for the habit; it is noteworthy, however, that the two South American blood-suckers have very sharp upper incisors, which are used to puncture the victim's skin.

FAMILY EMBALLONURIDÆ

Free-tailed Bats

The tail perforates the inter-thigh membrane and appears on its upper surface, distinctly back from the hinder edge of the membrane. The first finger is without phalanges. Tragus present. Ears separate.

Key to Genera of Emballonuridæ

A. Upper incisors, 2—2. Wings never with pouches *Emballonura*

AA. Upper incisors, 1—1. Wings with or without pouches

  B. Wing-pouch always well developed. Inner margin of ear papillate. Fur bicoloured, being much lighter at the base. Audital bullæ imperfect, the antero-internal sides incomplete. Outline of mandible markedly concave beneath premolars *Taphozous*

  BB. Wing-pouch absent or rudimentary (clearly developed in *mixtus* only). Inner margin of ear not papillate. Fur not bicoloured, never much lighter at the base. Audital bullæ perfect, the antero-internal sides complete. Outline of mandible convex beneath the premolars . . . . . . *Saccolaimus*

Genus Emballonura, Temminck

Upper incisors, 2—2; simple, small, but well developed, sub-equal, the inner tooth of each pair slightly the larger.

Dentition. $I\frac{2-2}{6},\ C\frac{1-1}{1-1},\ P\frac{2-2}{2-2},\ M\frac{3-3}{3-3} = 34.$

Key to Species of Emballonura

A. Size very large; forearm, about 53 mm.; greatest length of skull, 18·7 mm. Facial expansion of muzzle greater than that of the brain-case . *E. furax*

B. Size small; forearm, 33–34 mm.; greatest length of skull, 11 mm. No great facial expansion of muzzle, which is not equal to the expansion of the brain-case . . . . *E. papuana*

Emballonura furax, Thomas. Kapari River, South-west New Guinea. *Ann. Mag. Nat. Hist.*, (8) vii, 1911, p. 384.

Size larger than in any described species; the greatest length of the skull, 18·7 mm. General colour above uniform rich brown, the hairs rather paler basally. Under surface paler brown, the ends of the hairs lighter. Membranes naked throughout. Tragus of medium length, broader above than at base, each margin evenly convex, its tip rounded. Forearm, about 53 mm.; head and body, 61 mm.; tail, 19 mm.; ear, 19 mm.

Note. The largest species of the genus, with an enormously expanded muzzle; in the skull the facial expansion of the muzzle is distinctly greater than that of the brain-case.

Emballonura papuana, Thomas. Wakatimi, Mimika River, South-west Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (8) xiii, 1914, p. 443.

A much smaller species than the preceding one; the greatest length of the skull, 11 mm. The muzzle is short and stumpy, and the brain-case is high, large, and much inflated, without the greatly expanded muzzle of *furax*. The author omits the colour. Forearm, 33–34 mm.; head and body, 38 mm.; tail, 11 mm.; ear, 10 mm.

Genus Taphozous, Geoffroy

Wing-pouch (see diagram) always present and well developed. Inner margin of ear papillate. Lower lip scarcely grooved in front. Neck-pouch in *australis* pocket-like in the male; represented by a naked area with a rudimentary edge in the female. In *georgianus* there is no trace

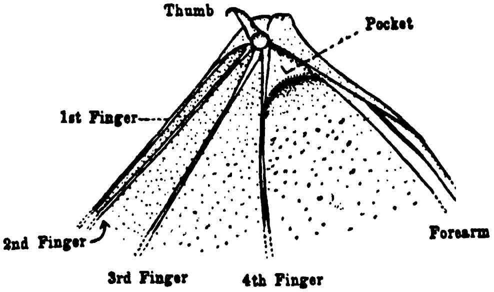


Diagram of a Section of the Wing of a *Taphozous*, showing the Distinct Wing-pocket or Pouch present in all Species of the Genus of a neck-pouch in either sex. Auditał bullæ incomplete antero-internally, being conspicuously emarginate on their inner sides. Lower outline of the mandible markedly concave beneath the front premolar. The small front upper premolar is proportionately much smaller than in the allied genus *Saccolaimus*; upper incisors, 1—1, weak and often absent in old individuals.

Dentition. $I\frac{1-1}{4},\ C\frac{1-1}{1-1},\ P\frac{2-2}{2-2},\ M\frac{3-3}{3-3} = 30.$

Key to Species of Taphozous

A. Neck-pouch present in male; represented by a naked area with a rudimentary edge in the female. Inter-temporal constriction of skull broad, 4·8–5 mm.; forearm, 61·5–66 mm.; tibia, 22·8–24·5 mm. . . . . . . *T. australis*

B. Neck-pouch absent in both sexes; no trace of a naked area with a rudimentary edge. Inter-temporal constriction of skull narrow, 4–4·1 mm.; forearm, 65–70 mm.; tibia, 26–28 mm. *T. georgianus*

NECK-POUCHED TAPHOZOUS

Taphozous australis, Gould. North-east Australia (Albany Islands, Cape York, Cooktown, and Cardwell), New Guinea (?). Gould's specimens were from "the maritime caves in the sandstone cliffs of Albany Islands," in great numbers. *Rec. Aust. Mus.*, xiv, 4, 1925, p. 332, Pls. XLVII–XLVIII.

Fur rather long, dense, and bicoloured, basally white above and below, the remaining three-fourths above dark brown, paler below. Neck-pouch in males forming a distinct small pocket enclosing a naked area in front; in females there is a naked area with a rudimentary edge posteriorly. Above, the inter-thigh membrane is furred as far as the point where the tail perforates it. Inter-temporal constriction of the skull broader than in *georgianus* (see Key). Forearm, 61·5–66 mm.; head and body, about 76 mm.; tail, 26–28·5 mm.; ear, 21–23 mm.

Note. I have shown in the *Records of the Australian Museum* quoted above that *T. fumosus* of De Vis (*Ann. Qld. Mus.*, 6, 1905, p. 37) is synonymous with *T. australis.*

NECK-POUCHLESS TAPHOZOUS

Taphozous georgianus, Thomas. Western Australia (King George Sound (type) and Derby), Northern Territory (Mary River), and Queensland (Coomooboolaroo, 80 miles south-west of Rockhampton). *Rec. Aust. Mus.*, xiv, 4, 1925, p. 336, Pls. XLVII–XLVIII.

Like *australis* in general appearance, but somewhat larger, and darker in coloration. The fur is bicoloured, being creamy white basally, above and below, while the tips are dark brown. This species is readily distinguished from *australis* by the absence of definite traces of a rudimentary neck-pouch in either sex, the region of the pouch being evenly but sparsely covered with hairs. The narrower intertemporal constriction in skulls of *georgianus* presents a marked difference in the general aspect of the skull in comparison with that of *australis*. Forearm, 65–70 mm.; head and body, about 78 mm.; tail, 28·5–33 mm.; ear, 21–24 mm.

Note. Though widely distributed, this species does not appear to extend far north of Rockhampton, while there are no records of *australis* south of Cardwell, so that, pending further records, we have two forms representing two well-defined geographical areas, *australis* being almost confined to the Cape York Peninsula.

Genus Saccolaimus, Temminck

Wing-pouch absent in *flaviventris*, very small or absent in *nudicluniatus*, and clearly developed in *mixtus* only. Inner margin of ear not papillate. Lower lip divided in front by a deep groove, varying in depth, but always deeper than in *Taphozous*. Neck-pouch always present, but sometimes quite rudimentary. Audital bullæ complete antero-internally, there being no sign of the openings on the inner sides found in those of *Taphozous*. Lower outline of the mandible convex beneath the premolars. The small front upper premolar is proportionately much larger and more acutely pointed than in the genus *Taphozous*.

Dentition. As in *Taphozous*; upper incisors, 1—1, weak and often absent in old individuals.

Note. The only species of this genus (*mixtus*) which possesses a wing-pouch nearly as large as that of *Taphozous* is readily distinguished from species of that genus by the colour of its fur, which is the same colour from base to tip, and not bicoloured as in *T. australis* and *T. georgianus*.

Key to Species of Saccolaimus

A. Under surface conspicuously lighter than the back
  B. Forearm, 70–80 mm. Wing-pouch entirely absent. Small secondary pouch-opening present externally below the large neck-pouch opening. Under surface creamy white. Australia only . . . . . *S. flaviventris*
  BB. Forearm, 61–63 mm. Wing-pouch present. Small secondary pouch-opening absent. Under surface pale buff brown. Papua . . . *S. mixtus*
AA. Under surface not conspicuously lighter than the back, but merely a somewhat paler brown. North-east Queensland and South Dutch New Guinea *S. nudicluniatus*

YELLOW-BELLIED SACCOLAIMUS

Saccolaimus flaviventris, Peters. South Australia, Northern Territory, New South Wales, Queensland. *Rec. Aust. Mus.*, xiv, 4, 1925, p. 315, Pls. XLVII–XLVIII.

Colour above uniform auburn to blackish brown; under surface creamy to yellowish white, conspicuously lighter than the back. Male with a large pocket-like neck-pouch, beneath the opening of which is situated another, smaller, secondary pouch-opening; there is no trace of a neck-pouch in the females. Wing-pouches entirely absent in both sexes. Tragus simple and flattened, with a deep notch on the outer edge just below the top. Size large, females on the average somewhat slighter in dimensions. Forearm, 70–80 mm.; tail, 23–31 mm.; ear, 20–24 mm.

Note. In the publication quoted above I have expressed the opinion that *T. hargravei* of Ramsay and *T. affinis* (var. *insignis*) of Leche are both synonyms of *flaviventris*. The species has been observed, living in colonies of four and five in hollow trees, by Miss Florence M. Irby, of the Casino district, New South Wales.

WING-POUCHED SACCOLAIMUS

Saccolaimus mixtus, Troughton. In the region of Port Moresby, Papua. *Rec. Aust. Mus.*, xiv, 4, 1925, p. 322, Pls. XLVII–XLVIII.

Colour above medium brown, darkest on the head and shoulders, washed with buff brown owing to the lighter tips of the fur; under surface conspicuously lighter than the upper, and said to be ashy white in life, but pale greyish buff brown after long preservation. Neck-pouch in the male forming a shallow but well-defined pocket, the margins of which enclose a naked area not covered by the flap of the pocket; in the female a neck-pouch is believed to be present and of similar shape, though smaller. Wing-pouch clearly developed, though not as large as that of the species of *Taphozous*. This is a much smaller form than either *flaviventris* or *nudicluniatus*, while the tragus is not so simple and flattened as in the former, and not so short and bulbous above as in the latter. Forearm, 61–63 mm.; tail, about 23 mm.; ear, 20 mm.

Note. This is the only species of *Saccolaimus* possessing a wing-pouch nearly as large as those of the *Taphozous* species, but it is readily distinguished from members of that genus by its fur being of one colour from base to tip, and not bicoloured as in *T. australis* and *T. georgianus*.

NAKED-TAILED SACCOLAIMUS

Saccolaimus nudicluniatus, De Vis. North-east Queensland (Cardwell), South-west Dutch New Guinea (Mimika River). *Rec. Aust. Mus.*, xiv, 4, 1925, p. 325, Pls. XLVII–XLVIII.

Colour above deep reddish brown, mottled with a number of irregular whitish patches ; under surface paler brown, but not very conspicuously lighter than the back. Rump almost naked, the long fur barely reaching within 8 mm. of the tail-base. Neck-pouch represented in females by a well-defined, almost naked area encircled behind by rudimentary pouch edges ; though males have never been examined there is doubtless a neck-pouch present. Wing-pouch either absent or rudimentary. The upper part of the tragus is peculiarly bulbous, with a semicircular outline above, much more thickened than in *flaviventris* or *mixtus*. Form stout. Digits proportionately short and heavy. Forearm, 71–75 mm. ; head and body, about 89 mm. ; tail, 24–26 mm. ; ear, 18–20 mm.

Note. For reasons set out in the publication quoted above I have regarded *T. granti*, described by Thomas from the New Guinea locality, as synonymous with this species, although additional specimens may yet show *granti* to be sub-specifically distinct, and representative of a slightly smaller form. The cranial characters, however, appear to be exactly similar, and additional material may serve only to confirm my union of the two species.

FAMILY VESPERTILIONIDÆ

Simple-nosed Bats

Muzzle and lips simple. Nostrils situated at the extremity of the muzzle, circular or crescent-shaped, usually without, rarely with, a simple nose-leaf. Ears usually separate, and with well-developed straight or slightly curved tragi (see diagram on p. 50). The tail is long, and extends to the hinder edge of the wide inter-thigh membrane, but never much beyond. Upper incisors separated in the middle by a wide space.

Genus Nyctophilus, Leach

Australian Long-eared Bats

A low but evident nose-leaf on the muzzle; the latter is narrow and thinly covered with short hairs. Ears large, oval, united at their inner bases by a membrane which runs across the top of the head. Tragus short and broad, triangular. Upper incisors single-pointed, close to the canines.

$$\textit{Dentition.}\quad I\,\frac{1-1}{6},\ C\,\frac{1-1}{1-1},\ P\,\frac{1-1}{2-2},\ M\,\frac{3-3}{3-3} = 30.$$

Note. Until quite recently all the Australian species of this genus were regarded as synonyms of *N. timoriensis*, but Mr Oldfield Thomas in 1914 (*Ann. Mag. Nat. Hist.*, (8) xiv, p. 383) suggested that the earliest name, *timoriensis*, should be dropped, as it is quite impossible to identify it with certainty with any Australian species, and it may yet turn up in Timor.

Thomas also says that quite a number of species are distinguishable by their skull characters, though it is not possible to define them all completely. He then proceeds to summarize the species and sub-species of the Australian long-eared bats, and, unless otherwise stated, the reference is *Ann. Mag. Nat. Hist.*, (8) xv, 1915, pp. 493–499.

The fur above varies from dark to light brown; below from pale brown to white.

Nyctophilus major, Peters. Western Australia (Perth, King George Sound, Southern Cross).

Size largest of the genus, a skull measuring 19·8 mm. in greatest length. Nose-leaf of the less developed type, low, rounded, nearly uniformly hairy, the division into two scarcely perceptible. Forearm, 41 mm.; head and body, 60–75 mm.; tail, 43 mm.; ear, 23 mm.

Nyctophilus geoffroyi, Leach. Australia and Tasmania. For restricted localities see sub-species below.

Size small or medium. Ears proportionately large. Nose-leaf of the most highly developed type, high, the two divisions connected with each other and surpassed above by a median, smooth, and naked membrane, which is folded to form a Y-shaped groove on its front surface.

Note. Three sub-species are recognized:

Nyctophilus geoffroyi geoffroyi, Thomas. Western Australia.

Size smaller, a skull 14 mm. in length. Colour rather dark.

Nyctophilus geoffroyi pallescens, Thomas. Arid central region of Australia, Lake Eyre, South Australia, Normanton, North-west Queensland, Alexandria, Northern Territory. *Ann. Mag. Nat. Hist.*, (8) xi, 1913, p. 79.

Like true *geoffroyi*, but colour much paler. Greatest length of skull, 15·3 mm.

Nyctophilus geoffroyi pacificus, Gray. South-east Australia and Tasmania.

Averaging rather larger than true *geoffroyi*; greatest length of type skull, 15·8 mm. Colour dark.

Nyctophilus sherrini, Thomas. Tasmania.

Size large, only slightly less than in *N. major*. Ears of medium size for the genus. Nose-leaf of the less developed type, as in *major*, therefore contrasting with the other Tasmanian species, *N. g. pacificus*, which has the highly developed nose-leaf described under *geoffroyi*. Skull shorter than in *major*; the greatest length 18·5 mm. Forearm, 45 mm.; head and body, 55 mm.; tail, 45 mm.; ear, 26 mm.

Note. This species is most nearly related to the Western Australian *major*, but has a smaller, differently shaped skull and a shorter tooth-row. It is much larger than the other Tasmanian form, *N. g. pacificus*, of which Tomes' *N. unicolor* is a synonym.

Nyctophilus gouldi, Tomes. New South Wales and South Queensland, from the Blue Mountains and Sydney northward to near Bundaberg, Queensland.

Size rather large; greatest length of an adult skull, 17·7 mm. Nose-leaf of a development midway between that of *major* and *geoffroyi*; fairly high, divided in the centre by a notch, the middle line of which tends to be grooved, naked, and of a different texture from the rest. (See Fig. 6.)

Nyctophilus bifax, Thomas. North Queensland within the tropics, Herberton, Cooktown, Cloncurry, Cape York, and Torres Strait islands.

Size fairly large; greatest length of skull, 17·7 mm. Ears decidedly smaller than in *gouldi*. Colour medium, cinnamon brown above, a little paler below. Nose-leaf of the less developed type; low, rounded, nearly uniformly hairy, the division into two scarcely perceptible. Skull strongly built, with well-developed ridges. Forearm, 40–43 mm.; head and body, 54 mm.; tail, 43 mm.; ear, 23·5 mm.

Nyctophilus microtis, Thomas. Papua.

Size rather smaller than in *bifax*; greatest length of skull, 16·5 mm. Ear short, 21 mm. Nose-leaf of medium development as in *gouldi*. Skull smaller and more slenderly built than in *bifax*, to which it is nearly allied.

Of this species two colour races may be distinguished:

Nyctophilus microtis microtis, Thomas. Sogere, Owen Stanley Range, Papua.

Colour brown above as in *bifax*; under surface not, or scarcely, lighter than upper.

Nyctophilus microtis bicolor, Thomas. Aroa River, near coast, Papua.

Colour greyish brown (olive brown) above; under surface strongly contrasted greyish white, the hairs slaty at their bases, their terminal halves creamy white. Forearm, 40 mm.; ear, 21 mm.; greatest length of skull, 16·5 mm.

Note. Presumably the representative in the low-lying coastal country of the *N. m. microtis* of the mountains behind.

Nyctophilus dædalus, Thomas. Northern Territory (Daly River, Port Essington, Melville Island).

Size fairly large; greatest length of skull, 17·3 mm. Ears about as in *bifax*, smaller than in *gouldi*. Colour of a skin from Melville Island rich brown, under surface lighter, near Saccardo's umber. Nose-leaf of the less developed type; low, rounded, nearly uniformly hairy, the division into two scarcely perceptible. Forearm, 41 mm.; head and body, 52 mm.; tail, 41 mm.; ear, 22 mm.

Note. This species differs from *N. gouldi* in its less developed nose-leaf, and from *N. bifax* in a character which is difficult to check; in *dædalus* the baculum (penis bone) is simple and not divided at its tip, whereas that of *bifax* is distinctly bifurcate.

Nyctophilus walkeri, Thomas. Northern Territory (Adelaide River).

Size conspicuously smaller and ears shorter than in any other species; greatest length of skull, 13 mm. Nose-leaf of medium development, fairly high, divided in the centre by a notch, the middle line of which tends to be grooved, naked, and of a different texture from the rest. Forearm, 33·5 mm.; head and body, 45 mm.; tail, 36 mm.; ear, 10·5 mm.

Note. Only one specimen of this very distinct species is yet known.

Nyctophilus geayi, Trouessart. Forests on the banks of the Nicholson River, Victoria, South-east Australia. *Bull. Mus. d'Hist. Nat.*, xxi, 1915, 5, pp. 146–147.

Size small; greatest length of skull slightly less than 10 mm., and therefore less than any other species. Form delicate. Ears very large. Nose-leaf of a less developed type than that of *walkeri*; the elevation is quite low, rounded, and nearly uniformly hairy, its division into two scarcely perceptible. Fur of a uniform brown above and below. Forearm, 39 mm.; head and body, 48 mm.; tail, 45 mm.; ear, 26 mm.

Note. The large size of the ears in contrast with the delicate body distinguishes this species from all others; in the other small species, *walkeri*, the ears are very short.

Genus Pharotis, Thomas

Nearly allied to *Nyctophilus*, but the ear and nasal membranes more developed. Nose-leaves larger than in that genus: the front one broad, high, its upper margin evenly convex, without a middle depression or notch; no vertical ridge between the nostrils; hind projection not a mere thickening of the skin, but a more or less definite leaf, as high as, though narrower than, the front leaf; concavities in front of and behind it deep, their deepest part naked and peculiarly wrinkled. Ears very large, thin, leafy, connected across the forehead by a high band. Tragus long, narrowed terminally, the peculiar thickened lobe on the back placed in the middle instead of on the outer edge and extending outward nearly to each side. Palate much shortened, and teeth, though of the same number, reduced in size from those of *Nyctophilus*.

Pharotis imogene, Thomas. Kamali, Lower Kemp-Welch River, Papua. *Ann. Mag. Nat. Hist.*, (8) xiv, 1914, pp. 381–383.

Size as in *N. geoffroyi*; greatest length of skull, 15 mm. Colour dark brown above and below; ears and membranes uniformly brown. Membranes practically naked throughout. Forearm, 37·5 mm.; head and body, 50 mm.; tail, 42 mm.; ear, 25 mm.; tragus, length on inner edge, 7·3 mm., breadth, 4·4 mm.

Genus Eptesicus, Rafinesque

Muzzle broad and obtuse. Outer edge of ear-lobe arising midway between the angle of the mouth and the base of the tragus, or nearer to the tragus. Ears separate; tragus well developed. Calcaneum with a small post-calcaneal lobe (see diagram on p. 50) on its posterior margin. Crown of head very little raised above the face-line. Nostrils simple, crescent-shaped, without nose-leaves.

Both upper incisors well developed, the inner larger than the outer, and with a distinct secondary cusp; the outer incisor small and leaning toward the inner. Canines simple, with a basal ledge, but no secondary cusps.

Dentition. $$\mathrm{I}\frac{2\text{—}2}{6},\ \mathrm{C}\frac{1\text{—}1}{1\text{—}1},\ \mathrm{P}\frac{1\text{—}1}{2\text{—}2},\ \mathrm{M}\frac{3\text{—}3}{3\text{—}3} = 32.$$

Little Bat

Eptesicus pumilus pumilus, Gray. All Australia, Tasmania, and Lord Howe Island. *Cat. Chiroptera Brit. Mus.*, 1878, p. 201, Pl. XII, Fig. 2.

General colour of back buffy brown, base of fur blackish brown; lighter below. Ear-lobes short and funnel-shaped. Tragus well developed. Post-calcaneal lobe long. Wings extending to the bases of the toes. Forearm, 32 mm.; head and body, about 44 mm.; tail, 38 mm.

Note. Of this species two races are distinguished by Thomas in *Ann. Mag. Nat. Hist.*, (8) xiii, 1914, pp. 439–440.

Eptesicus pumilus caurinus, Thomas. Drysdale, Kimberley, North-western Australia.

General characters as in *pumilus*, but size smaller, the forearm 30 mm. and about the minimum for the species; skull conspicuously smaller, its greatest length 11·2 mm. Tips of the hairs drabby grey; under surface not lighter than upper. Skull less flattened than in true *pumilus*.

Eptesicus pumilus vulturnus, Thomas. Tasmania.

Size and general characters as in true *pumilus*, but colour much darker; above dark auburn brown, the bases of the hairs blackish brown; below the surface colour is but little lighter, though of a rather more drabby tone. Skull low, flattened, its size about, and its greatest length (12·5 mm.), that of the true *pumilus*; forearm, 33 mm.

Genus Philetor, Thomas

Muzzle broad and much swollen; the nostrils far apart, their edges not projecting. Ears separate, short; laid forward they hardly reach half-way between the eye and nostril; the outer base of the ear running forward to behind and below the angle of the mouth. Tragus short, thickened, fleshy. Wings comparatively short. Post-calcaneal lobe present.

Dental formula and teeth as in *Eptesicus*, but the inner upper incisor is more lengthened and more strongly two-pointed, and the upper canine has a distinct supplemental cusp at its posterior base not found in *Eptesicus*.

A single species of the genus is so far known.

Philetor rohui, Thomas. Albert Edward Range, alt. 6000 feet, Papua. *Ann. Mag. Nat. Hist.*, (7) ix, 1902, p. 220.

Fur short and close. Colour above, in alcohol, reddish brown; rather paler below. Wings attached to the lower end of the tibia. Forearm, 34·5 mm.; head and body, 58 mm.; tail, 32 mm.; ear, 14 mm.; tragus, on inner edge, 2·6 mm.; skull, greatest length, 14·7 mm.

Genus Pipistrellus, Kaup (*Vesperugo* in part)

General characters as in *Eptesicus*, but upper premolars 2–2.

Dentition. $I\frac{2-2}{6}, C\frac{1-1}{1-1}, P\frac{2-2}{2-2}, M\frac{3-3}{3-3} = 34.$

YELLOW-HEADED BAT

Pipistrellus abramus, Temminck. A species of wide distribution, called in India the Coromandel bat, but spread over Ceylon, China to Japan, the Malaysian islands, Northern Australia, and Solomon Islands. In summer it travels westward as far as Central Europe. *Cat. Chiroptera Brit. Mus.*, 1878, p. 226.

Fur dark brown above, tipped with light yellowish brown; head and neck wholly yellowish brown; below sooty brown, the tips lighter than those of the upper surface. Ear-lobes broadly triangular, rounded at the tips, their outer margins almost straight. Post-calcaneal lobe distinct and rounded. Head and face, between the eyes, densely covered with fur; space in front of the ears, about the eyes, and extremity of muzzle generally almost naked. Forearm, about 34 mm.; head and body, about 48 mm.; tail, about 38 mm.

Pipistrellus tasmaniensis, Gould (*Vesperugo krefftii*, Peters *et auct.*). New South Wales, South-western Australia, Tasmania. *Proc. Zool. Soc.*, ii, 1906, p. 470.

Fur above dark reddish brown, below paler. Ear-lobes shorter than the head, triangular, the tips rounded and distinct. Tragus acutely pointed and curved inward, with a distinct acutely triangular lobe at the base of the outer margin. Post-calcaneal lobe very shallow. Face, in front of the ears, nearly naked. Forearm, about 50 mm.; head and body, about 61 mm.; tail, about 51 mm.

Pipistrellus regulus, Thomas. King George Sound, Western Australia. *Proc. Zool. Soc.*, ii, 1906, p. 470.

General colour above dark Prout's brown; below the ends of the hairs are nearer wood brown, except on the inter-thigh membrane, where they become whitish. Fur rather long and shaggy, extending thickly as a well-defined band on the inter-thigh membrane above for its basal half-inch to the level of the knees. Ears simple, with their inner margins apparently very convex. Post-calcaneal lobe narrow. Outer incisors and small premolars minute. Forearm, 38 mm.; head and body, 47 mm.; tail, 44 mm.

Though without strongly marked characteristics, this dull-looking bat does not agree with the other species.

Pipistrellus papuanus papuanus, Peters and Doria. Salawatti, New Guinea. *Ann. Mus. Civ. Genova*, xvi, 1880–1, p. 696.

General colour brown, with black wing-membranes. Ears triangular, with rounded tips, the lobes at the bases of the outer margins rounded. The greatest width of the tragus is a little above the middle of its height. Nostrils with a central prominence between them. The base of the thumb and the sole of the foot have small cushion-like suckers on them. Post-calcaneal lobe well developed. The first upper incisor is two-pointed, its outer cusp a little higher than the second incisor. The first upper premolar is placed internal to the tooth-row ; it is sharp, and clearly seen from the outside. The first lower premolar is only half as high as the second. Forearm, 27–31 mm. ; head and body, 37 mm. ; tail, 29 mm. ; ear, 10 mm.

The following two forms have since been described :

Pipistrellus papuanus collinus, Thomas. Papua (head of Mambari River, Owen Stanley Range, Upper Aroa River). *Ann. Mag. Nat. Hist.*, (9) vi, 1920, p. 533.

Like true *papuanus* in colour, tragus, dentition, and all other details, but size markedly larger, the forearm attaining a length of 36 mm., as compared with 27–31 mm. The skull is also decidedly larger, its greatest length 13·2 mm.

Note. Thomas says that the pipistrels of New Guinea all seem referable to *papuanus.* This form appears to be a highland sub-species, characterized by its markedly greater size.

Pipistrellus papuanus orientalis, Meyer. Astrolabe Bay, East New Guinea. *Abh. Mus. Dresden*, vii, 7, 1899, p. 14.

The forearm is 27–31 mm. long ; the feet more robust ; and the first lower premolar is one-third the size of the second, instead of one-half, as in the true *papuanus.*

Note. Said by the author to be sub-specifically distinct, but the characters merge into those of the true *papuanus*, and Thomas says it is apparently quite the usual pipistrel.

Genus Chalinolobus, Peters

LOBE-LIPPED BATS

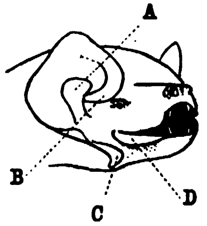
This genus is immediately distinguished by the distinct fleshy lobes at the angles of the mouth, which project outward. Crown of head slightly raised above face-line. Ears short and broad; tragus expanded above and curved inward. Post-calcaneal lobe present. Upper incisors unequal, single-pointed. The first upper premolar is minute, crowded in between the canine and the large second premolar.

Dentition. $I\frac{2-2}{6}$, $C\frac{1-1}{1-1}$, $P\frac{2-2}{2-2}$, $M\frac{3-3}{3-3} = 34$.

GOULD'S BAT

Chalinolobus gouldi gouldi, Gray. Australia generally, Tasmania, and Norfolk Island. *Cat. Chiroptera Brit. Mus.*, 1878, p. 250, Pl. XIV.

Fur on the head, neck, and shoulders black, with a faint reddish tinge, the rest of the back medium brown; below chin to breast ashy brown, breast lighter; lower abdomen, sides, and on wing-membranes buffy white. Ears with their inner basal margins forming a distinct flap projecting back-



HEAD OF *Chalinolobus gouldi* (GRAY), SHOWING THE LOBED LIP CHARACTERISTIC OF THE GENUS AND EAR-FEATURES TYPICAL OF THIS SPECIES

A, tragus; *B*, backwardly projecting flap of inner ear margin; *C*, pendent vertical flap of outer ear margin; *D*, flesh-lobe projecting outward at mouth angle.

ward (see diagram on p. 75); outer margin of the ear terminating in a pendent vertical flap; tragus broad above. Post-calcaneal lobe well developed and rounded. Forearm, about 46 mm.; head and body, about 64 mm.; tail, about 57 mm.

One sub-species is recognized:

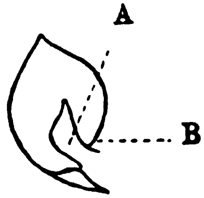
Chalinolobus gouldi venatoris, Thomas. Alexandria, Northern Territory—the farthest north that *Ch. gouldi* has been found. *Ann. Mag. Nat. Hist.*, (8) ii, 1908, p. 372.

Similar to true *Ch. gouldi* in essential characters, but size smaller and the colour darker. Skull smaller throughout; its greatest length 14 mm. Forearm, 40 mm.; head and body, 54 mm.; tail, 42 mm.; ear, 11 mm.

CHOCOLATE BAT

Chalinolobus morio, Gray. Southern Queensland, New South Wales, Central, South, and South-western Australia, Tasmania, and Lord Howe Island. *Cat. Chiroptera Brit. Mus.*, 1878, p. 248, Pl. XIV.

Fur above dark brown; almost black on the head and anterior part of the body, passing into dark chestnut brown posteriorly; below slightly paler. Body fur rather long and thick. Ears without their internal basal lobes forming distinct flaps (see diagram); tragus narrow at the base and tip, expanded in the middle. Post-calcaneal lobe well developed. Forearm, about 38 mm.; head and body, about 47 mm.; tail, about 44 mm.



EAR OF *Chalinolobus morio* (GRAY), FOR COMPARISON WITH THE CHARACTERS OF *Ch. gouldi*

A, tragus; *B*, inner base of ear without a distinct flap projecting backward.

DOBSON'S BAT

Chalinolobus signifer, Dobson. South-central Queensland. *Cat. Chiroptera Brit. Mus.*, 1878, p. 250, Pl. XIV.

Like the preceding species, but carrying an erect transverse process on the face between the eyes.

Note. Mr Oldfield Thomas has found traces of the facial ridge in specimens of *morio* from many localities, and has suggested that it is due to sex or age; therefore *signifer* is now generally considered to be synonymous with *morio*.

PIED OR BLACKISH-GREY BAT

Chalinolobus nigrogriseus, Gould. Northern and Eastern Australia, New Guinea. *Cat. Chiroptera Brit. Mus.*, 1878, p. 251, Pl. XIV.

Fur above deep black, with grey or pale brown tips to the hairs; below similar, but with ashy tips. Ears with their inner basal margins forming a distinct flap, projecting backward as in *gouldi* (see diagram on p. 75), but the outer margins of the ears terminating in a horizontal flap, instead of a pendent vertical one as in *gouldi*; tragus expanded outward above. Post-calcaneal lobe well developed and rounded. Forearm and tail, each about 33 mm.; head and body, about 44 mm.

Chalinolobus rogersi, Thomas. Parry's Creek, North-east Kimberley, North-western Australia. *Ann. Mag. Nat. Hist.*, (8) iii, 1909, p. 150.

A small species most nearly allied to *nigrogriseus*. General colour grey, resulting from the hairs being deep brownish black with dull whitish tips, the whole giving a striking and unusually hoary appearance to the bat; similar below, but the light tips are broader and more drab in tone. On the wing-membrane, which is hairy to a line joining the elbow and knee, the hairs are whitish for their terminal halves, as are those edging the inter-thigh membrane. Post-calcaneal lobe well developed. Forearm, 34·5 mm.; head and body, 45 mm.; tail, 34 mm.; ear, 6 mm.

Note. Distinguished from the preceding species by its hoary colour and smaller skull.

Genus Scoteinus, Dobson (*Scotophilus* in part)

Form stout. Muzzle short, naked. Crown of the head only slightly raised above the face-line. Nostrils close together, simple. Ears short, longer than broad, with their outer margins nearly reaching round to the corners of the mouth; tragus tapering, curved inward. Calcaneum weak. One upper incisor on each side, long, single-pointed, and placed close to the canines.

Dentition. $I\,\frac{1-1}{6},\ C\,\frac{1-1}{1-1},\ P\,\frac{1-1}{2-2},\ M\,\frac{3-3}{3-3} = 30.$

Key to Species of Scoteinus

A. Largest species. Forearm, 51–57 mm. New South Wales . . . . *S. rueppellii*
AA. Smaller species. Forearm, 31–39 mm.
  B. Colour the same above and below. Northern and Central Australia and Queensland
    C. Size smaller. Forearm, 31–34 mm. *S. greyi*
    CC. Size larger. Forearm, 39 mm. . *S. influatus*
  BB. Colour different above and below. Western Australia. Forearm, 34–35 mm. . *S. balstoni*

Rueppell's Bat

Scoteinus rueppellii, Peters. New South Wales. *Cat. Chiroptera Brit. Mus.*, 1878, p. 263, Pl. XV.

Colour dark brown above, paler below; the extreme tips of hairs above, and terminal fourth below, ashy, sometimes with a chestnut tinge throughout. Ears short, the tips obtusely rounded; tragus rather narrow and sub-acutely pointed. Forearm, 51–57 mm.; head and body, about 70 mm.; tail, nearly 51 mm.

Grey's Bat

Scoteinus greyi, Gray. Northern and Central Australia (Port Essington), Queensland, and New South Wales

(Liverpool Ranges). *Cat. Chiroptera Brit. Mus.*, 1878, p. 263, Pl. XV.

Fur short, the face in front of the eyes nearly naked; chestnut brown above and below, the extreme tips below ashy. Tragus broad, obtuse. Post-calcaneal lobe small, but distinct, rounded. Forearm, about 31 mm.; head and body, about 44 mm.; tail, about 31 mm.

Scoteinus influatus, Thomas. Type from Prairie, County Mitchell, Queensland. *Ann. Mag. Nat. Hist.*, (9) xiii, 1924, p. 540.

General colour (of spirit specimen) brown, the under side not perceptibly lighter than the upper; colour of lower belly not determinable in the single specimen known; wings white-edged along their hinder margin. Ears of normal size and shape. Post-calcaneal lobule narrow, but perceptible. Skull more flattened than in *rueppellii*, shaped about as in *balstoni*, but much smaller than that of the former, larger than in the latter. A well-marked occipital helmet present. No secondary cusp on the upper incisor. Forearm, 39 mm.; head and body, 59 mm.; tail, 31 mm.; ear, 12 mm.

Note. A medium-sized species, much smaller than *rueppellii*, larger than *greyi* and *balstoni*; it is probably the East Australian representative of the latter.

BALSTON'S BAT

Scoteinus balstoni, Thomas. Western Australia (North Pool, Laverton, Derby, Kimberley). *Proc. Zool. Soc.*, ii, 1906, p. 472.

Allied to *influatus*, but smaller, and the upper and lower surfaces are of different shades of colour, instead of being practically unicoloured as in *influatus* and *greyi*. Colour above pale brown, the basal two-thirds of the fur being smoky brown and contrasting markedly with the light tips; on the under surface the hairs are equally dark at the base, with their tips pale pinkish buff. The post-calcaneal lobe is well marked. Forearm, 34–35 mm.; head and body, 55 mm.; tail, 40 mm.; ear, 15 mm.

Genus Myotis, Kaup (*Vespertilio* in part)

Muzzle long, thickly hairy. Crown of head vaulted, slightly raised above face-line. Nostrils simple, crescentic, not projecting. Ears oval, longer than broad, separate, their outer margins not reaching round to the corners of the mouth; tragus long, attenuated upward, acutely pointed. Four upper incisors, in pairs, placed close to the canines.

Dentition. $$\mathrm{I}\frac{2-2}{6},\ \mathrm{C}\frac{1-1}{1-1},\ \mathrm{P}\frac{3-3}{3-3},\ \mathrm{M}\frac{3-3}{3-3}=38.$$

Note. This genus retains the maximum number of teeth known to occur in the order Chiroptera (see diagram on p. 45).

GREY-FOOTED MYOTIS

Myotis adversus, Horsfield. Northern half of Australia, through Celebes to Siam. *Cat. Chiroptera Brit. Mus.*, 1878, p. 292, Pl. XVIII.

The extremity of the ear broadly triangular, rounded off; upper half of outer margin straight; tragus well developed, the extremity straight. Wings reaching to the ankles. Inter-thigh membrane forming a very acute angle behind. Calcaneum very long, extending at least three-fourths of the distance between the ankle and the tail. Feet very large, about 13 mm. long. Second upper premolar extremely small, and placed internal to the tooth-row, not visible from without. Forearm, about 38 mm.; head and body, about 51 mm.; tail, about 44 mm.

SMALL-FOOTED MYOTIS

Myotis australis, Dobson. New South Wales. *Cat. Chiroptera Brit. Mus.*, 1878, p. 317.

Extremity of ear broad and very obtusely rounded; upper third of outer margin deeply concave; tragus well developed, the narrow extremity rounded and slightly curved outward. Wings attached to the bases of the toes. Inter-thigh membrane forming an obtuse angle behind. Calcaneum extending about half-way between the ankle and the tail. Feet of moderate size, about 9 mm. long. Second upper premolar small, but in the normal position, and therefore visible from without. General colour brown, the extreme tips of the fur above and the terminal third below lighter. Forearm and tail, each about 38 mm.; head and body, about 46 mm.

Genus Kerivoula, Gray

Muzzle narrow and elongated. Crown of the head considerably vaulted. Nostrils simple, circular. Ears slightly but noticeably funnel-shaped, diaphanous, and studded with glandular papillæ, their outer margins not reaching round to the corners of the mouth; tragus long, narrow, acutely pointed. Wings attached to the bases of the toes. Calcaneum long, strong, and curved backward; post-calcaneal lobe absent. Outer incisor shorter than the inner; middle lower incisors with three cusps; canines normal in form and rather small.

Dentition. $I\frac{2-2}{6}, C\frac{1-1}{1-1}, P\frac{3-3}{3-3}, M\frac{3-3}{3-3} = 38.$

Note. Like the preceding *Myotis*, this genus retains the maximum number of teeth known in the order Chiroptera (see diagram on p. 45).

Kerivoula agnella, Thomas. St Aignan Island, south-east of Papua, possibly Duke of York Islands also. *Ann. Mag. Nat. Hist.*, (8) ii, 1908, p. 372.

General colour above and below (in spirit) greyish brown; rather more fulvous on the legs, tail, and inter-thigh membrane, which are all well haired. Outer upper incisor about three-fourths the height of the inner one; lower incisors overlapping. Forearm, 38 mm.; head and body, 44 mm.; tail, 48 mm.; ear, 13·5 mm.; tragus, on inner edge, 8 mm.

Genus Phoniscus, Miller

Like *Kerivoula*, but distinguished from it by having the upper canines strongly compressed laterally, with a deep longitudinal groove on the outer sides of their shafts, and their lengths so increased that their points extend noticeably beyond the exposed portions of the lower canines when the jaws are closed; the four-cusped inner lower incisors also distinguish this genus from *Kerivoula*, which has three-cusped inner ones.

Externally as in *Kerivoula*, except for the pockets on the inner sides of the lower lip in which the tips of the long upper canines are sheathed.

Dentition. Number of teeth as in *Kerivoula*.

EASTERN FOREST BAT

Phoniscus papuensis, Dobson. North-eastern Australia, South-eastern Papua. *Cat. Chiroptera Brit. Mus.*, 1878, p. 339.

Fur above dark brown, with shining yellow tips; below paler brown, with shining grey tips; forearm clothed with short golden hairs. Ears nearly reaching to the end of the muzzle when pressed forward, the tips rounded, and the outer margins with a deep concavity occupying their upper fourths; tragus with a distinct rounded lobe at the base of its outer margin, succeeded by a deep notch. Forearm, about 38 mm.; head and body, about 46 mm.; tail, about 46 mm.

Genus *Miniopterus*, Bonaparte

Muzzle rather short and broad. Crown of the head abruptly and very considerably raised above the face-line; a deep groove runs from below each eye toward the nose. Nostrils simple, lunate, sublateral. Ears small, rhomboidal, separate, their outer margins arising near the mouth corners; tragus high, slender, slightly curved forward at the tip. Tail as long as the head and body. Post-calcaneal lobe absent, but a strong curved calcaneum present. The last bony section of the second finger nearly three times as long as the next. Upper incisors in pairs, separated by a space from the canines.

Dentition. $I\frac{2-2}{6},\ C\frac{1-1}{1-1},\ P\frac{2-2}{3-3},\ M\frac{3-3}{3-3} = 36.$

Key to Species of Miniopterus

A. Colour darker ; reddish brown above
  B. Large ; forearm, 44–48 mm. Inter-thigh membrane naked above . . *M. schreibersii*
  BB. Smaller ; forearm, 39–41 mm. Inter-thigh membrane furred above between the lower legs . . . . . . *M. australis*
AA. Colour much paler ; uniform pale brown on back *M. orianæ*

Largest Miniopterus

Miniopterus schreibersii, Natterer. Australia, through Java, Timor, Amboina, to Japan and Europe. *Cat. Chiroptera Brit. Mus.*, 1878, p. 348.

Colour of fur a uniform reddish brown, sometimes tinged with grey. Inter-thigh membrane naked above. Length of tragus about twice its width, which is the same from the base to the somewhat rounded tip. Feet long and slender. Forearm, 44–48 mm. ; head and body, about 56 mm. ; tail, about 56 mm.

Note. This form, the larger of the three Australian species, may later have to be allotted the specific name *blepotis*, in common with the Amboina form, with which it agrees very well.

Smallest Miniopterus

Miniopterus australis, Tomes. Queensland, Loyalty Islands. *Cat. Chiroptera Brit. Mus.*, 1878, p. 351.

Fur dark reddish brown above ; below dark brown with greyish tips ; usually with a more rufous tinge than in *schreibersii*, owing to the reddish tips to the hairs. Inter-thigh membrane clothed with fur almost to a line drawn between the ankles. Forearm, 39–41 mm. ; head and body, about 44 mm. ; tail, about 44 mm.

Note. Differs from the other two Australian species in its smaller size, also from *schreibersii* in the distribution of the fur on the inter-thigh membrane, and from *orianæ* in its much darker colour.

PALE BROWN MINIOPTERUS

Miniopterus orianæ, Thomas. Port Darwin, Northern Territory, type from Casuarina Bay (sea-level). *Ann. Mag. Nat. Hist.*, (9) x, 1922, p. 616.

Colour nearly uniform pale brown, nearly but not quite as dark as sayal brown (Ridgway); under surface cinnamon, the inguinal region a little paler; head faintly greyer than the back. General characters as in the larger species referred to as *schreibersii*. Skull large, well inflated, agreeing closely with Queensland specimens of *schreibersii*; much larger than in *australis*. Forearm, 43–44 mm.; head and body, 57 mm.; tail, 47 mm.

Note. According to the author "The remarkably pale brown colour of this *Miniopterus* distinguishes it from any other member of the genus, for other pale species are of quite a different and more greyish kind of pallor."

FAMILY MOLOSSIDÆ

Wrinkled-lipped Bats

Tail thick, projecting far beyond the posterior margin of the inter-thigh membrane, which is movable upon it (Fig. 7). Ears variable in size and form; the tragus much reduced; the antitragus situated at the inner base of the ear, unusually large. Legs short and strong, with well-developed fibulæ. Feet large; the first toe and very often the fifth much larger than the others. Upper incisors strong.

Only two genera come within the area dealt with:

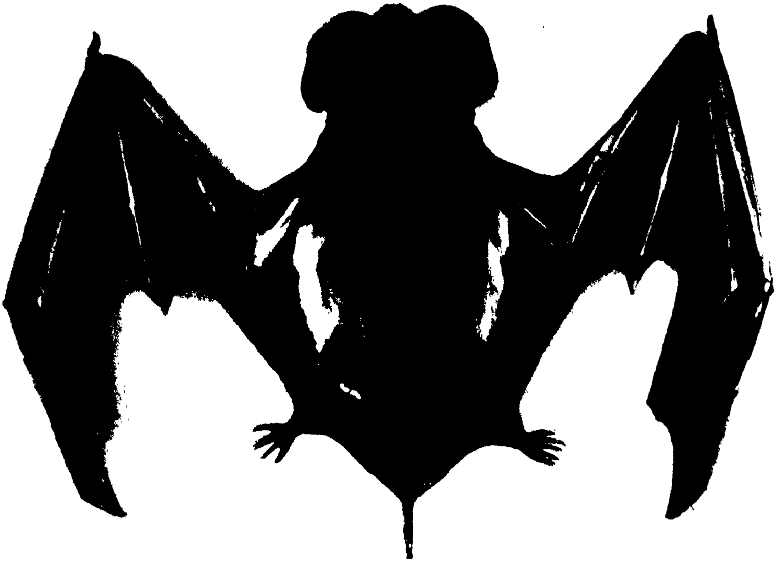
Genus Nyctinomus, Geoffroy

Muzzle projecting considerably beyond the lower jaw; upper lip generally deeply grooved by vertical wrinkles. Nostrils simple, circular. Ears large, rounded, and arising from the same point on the forehead; laid forward they extend beyond the extremity of the muzzle; tragus small,

6. Australian Long-eared Bat (*Nyctophilus gouldi*)

See p. 68.

Photo A. Musgrave



7. White-striped Bat (*Nyctinomus australis australis*)
Showing the white fur on either side of the under surface and the throat or gular pouch present in a more or less distinct form in some species of the genus and absent in others. Note the projecting tail upon which the interthigh membrane is movable up and down, which is a feature characteristic of the genus *Nyctinomus*.

Photo G. C. Clutton

flattened, squarely truncate above; antitragus variable in form, sometimes low and indistinct. First and fifth toes much longer than the others. Upper incisors, 1—1, strong, wide apart at the base, strongly converging at the tips.

Dentition. $I\frac{1-1}{4}, C\frac{1-1}{1-1}, P\frac{2-2}{2-2}, M\frac{3-3}{3-3} = 30.$

WHITE-STRIPED BAT

Nyctinomus australis australis, Gray. Western, South, and Central Australia, Victoria, New South Wales, Queensland, New Guinea. *Cat. Chiroptera Brit. Mus.*, 1878, p. 433, Pl. XXII, Fig. 9.

Fur moderately long and dense, above dark reddish brown, paler below; the species is distinguished by a white stripe on the under surface of each wing-membrane, which extends along the sides of the body, and may be slightly mixed with brown in some females. A large neck-pouch is present in both sexes, with a tuft of strong hairs projecting from the pouches of males. Upper lip with short vertical wrinkles. Ears large, their inner margins either united, or arising very close together if from distinct points of origin; tragus short and broad, the outer margin distinctly concave at its middle. Forearm, about 60 mm.; head and body, 76–85 mm.; tail, 45–47 mm. (Fig. 7).

Note. I have pointed out (*Proc. Linn. Soc. New South Wales*, xlix, 1924, p. xxv) that *N. albidus*, described by Leche in 1884, is synonymous with the above species. Mr Guy C. Shortridge, who collected the species at Laverton, in the south of Western Australia, wrote: "These bats come out rather late and are swift flyers. When passing over water they often dive right into it, probably in pursuit of water-beetles. The stomach contained remains of beetles."

One sub-species has been described:

Nyctinomus australis atratus, Thomas. Ooldea, South Australia. *Ann. Mag. Nat. Hist.*, (9) xiv, 1924, p. 456.

Fur above and below wholly black, the hairs black to their bases, in marked contrast to those of the typical *australis*, in which the bases of the hairs are decidedly lighter ; if there is any difference in the colour of the *atratus* fur it is at the tips, which may be faintly browner or paler ; the wing-membranes are without any trace of the very distinctive whitish line of fur along the sides of the body below, the hairs of this part being equally black with the rest ; the only light-coloured hairs on the animal are a few below, behind the thighs. Other characters as above. Forearm, 59 mm. ; head and body, about 91 mm. ; tail, 35 mm. ; ear, 25 mm.

Small Eastern Nyctinomus

Nyctinomus norfolkensis, Gray. Eastern Australia and Norfolk Island. *Cat. Chiroptera Brit. Mus.*, 1878, p. 439.

Fur reddish brown above, paler beneath. Ears triangular, shorter than the head, separate ; tragus triangular, rounded above. Muzzle flat and obtuse. Nostrils opening sublaterally. Upper lip with shallow vertical wrinkles. Neck-pouch small in the male, rudimentary in the female. The wing-membrane arises from the ankle. Forearm, about 38 mm. ; head and body, a little over 51 mm. ; tail, about 32 mm. (See Fig. 8.)

Small South-western Nyctinomus

Nyctinomus planiceps, Peters (*Nyctinomus petersi*, Leche *et auct.*). South and South-western Australia. *Proc. Zool. Soc.*, ii, 1906, p. 765.

Forearm and tail, about 34 mm. ; head and body, about 61 mm.

Note. This species is readily distinguished from its nearest ally, *norfolkensis*, by having the wing-membrane arising almost half-way up the tibia, instead of from the ankle. It also differs in the peculiarly flattened head, the upper profile of the skull being almost straight, as well as in the absence of the neck-pouch in both sexes, and in the nostrils opening directly forward.

Nyctinomus loriæ, Thomas. Kamali, Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 609.

Colour above fulvous or chestnut brown, the extreme bases of the hairs whitish; below the hairs are yellowish or whitish buff, sometimes tipped with brown on the sides; chin naked, brown, contrasting with the light-coloured throat and belly; wing-membranes above, outside a line drawn from the elbow to the knee, whitish or white, rest of membranes brown; below the whole of the membranes and limbs are white. Forearm, 32 mm.; head and body, 54 mm.; tail, 24–26 mm.; ear, 14 mm.

Note. Closely allied to *norfolkensis*, of which it is evidently the Papuan representative, but the short fur and white wing-membranes of this bat will readily distinguish it from both *norfolkensis* and *planiceps*.

Nyctinomus astrolabiensis, Meyer. Papua. *Abh. Mus. Dresden*, vii, 7, 1899, p. 19.

Upper surface Prout's brown; lower broccoli brown; wing-membranes brownish and naked. Head depressed. Muzzle broad, lips moderately wrinkled. Ears joined, subtriangular, the front margins straight; tragus small, subquadrate, base dilated. Wings fixed to the middle of the tibiæ. Less than half the tail is free. The second upper premolar is short; the four lower incisors crowded together, their crowns bifid. Forearm, 36 mm.; head and body, 66 mm.; tail, 34 mm.

Genus Chærephon, Dobson

Similar to *Nyctinomus* in all respects, except that the premaxillary bones are complete, filling the entire space occupied in *Nyctinomus* by the palatal emargination.

Plicated Bat

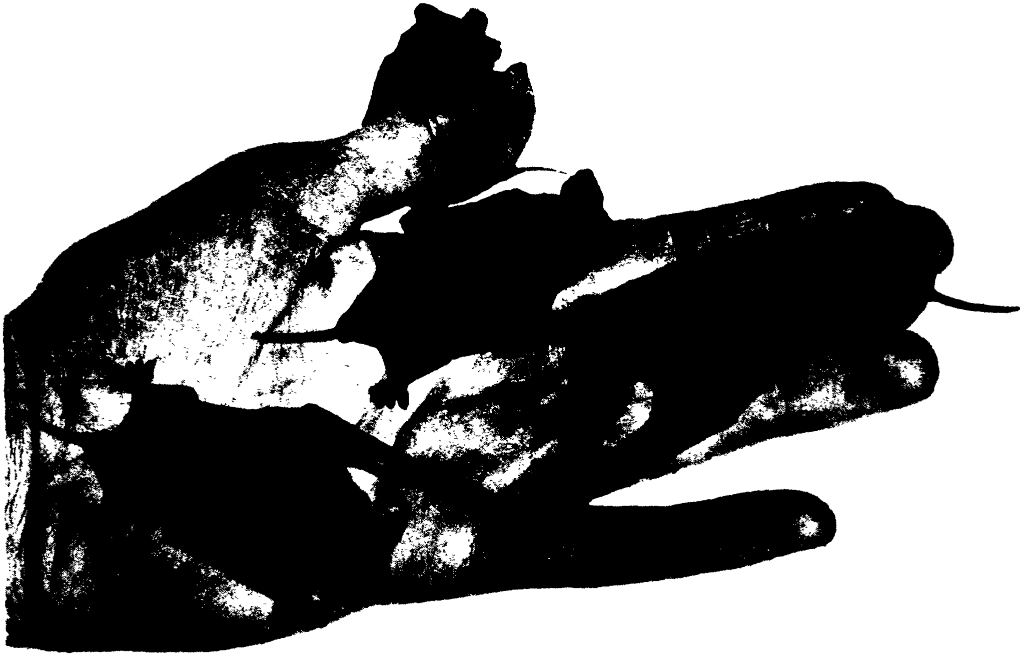
Chærephon plicatus plicatus, Buchanan-Hamilton. New Guinea, Fiji Islands. *Cat. Chiroptera Brit. Mus.*, 1878, p. 425.

Fur very soft and dense; above bluish or smoky black, below paler. Ears united by a low band in front, evenly and broadly rounded off above; tragus very small and quadrate, the upper margin slightly concave. Upper lip very thick, deeply grooved by vertical wrinkles. No neck-pouch. Wing-membrane from the lower end of the tibia. Forearm, nearly 51 mm.; head and body, 70 mm.; tail, about 44 mm.

One sub-species is recognized:

Chærephon plicatus colonicus, Thomas. South Australia, Alexandria, Northern Australia. *Proc. Zool. Soc.*, ii, 1906, p. 537.

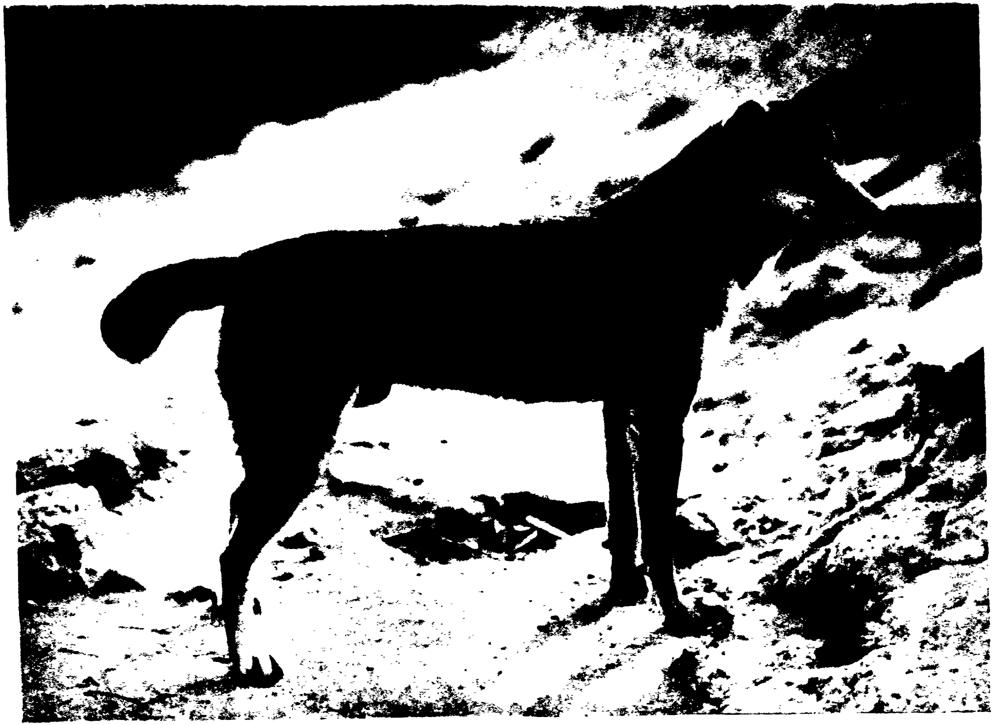
Similar in all essential characters to the true *plicatus*, but rather larger in body and limb-dimensions and markedly larger in the skull; the greatest length of the skull, 22 mm. Forearm, 50 mm.; head and body, 67 mm.; tail, 42 mm.; ear, 22 mm.



8. Four Small Eastern Wrinkled-lipped Bats (*Nyctinomus norfolkensis*)

Taken from a hollow tree near Sydney. The needle-like claws of the toes and thumbs cling to one's hand, drawing up the skin without piercing it. The manner in which the inter-thigh membrane is reefed up, or run out upon the mast of the tail, is well shown. The latter capability draws the membrane out of danger when crawling, and imparts added mobility in flight.

Photo A. Musgrave



9. DINGO (*Canis dingo*)

Photo S. T. Leigh and Co., Sydney

WILD DOGS

ORDER CARNIVORA

SUB-ORDER FISSIPEDIA

FAMILY CANIDÆ

HEAD elongated. Nose pointed, flat, and hairless, with central groove beneath. Well-developed canine teeth. Toes straight, with blunt claws; five on fore-limb, four on hind-limb.

In Australasia we have two species of wild dogs—namely, the well-known dingo, or warrigal, of Australia, and the native dog of New Guinea.

The dingo is one of the most widely spread of the few native animals that are not marsupial; it is found all over the continent. It does not occur in Tasmania, where its place is taken by the marsupial wolf, or thylacine. The latter animal was once found on the mainland, but, apparently owing to competition with the dingo, became extinct there.

For a long time zoologists were at a loss to account for the presence of a wild dog, a typical representative of the fauna of the outside world, in Australia. Various theories were put forward, without any definite conclusions being reached.

The genus *Canis* has two main branches—the wolves of the Northern Hemisphere and the jackals of Southern Asia and Africa. There are slight structural differences between the two forms; one is that in the jackals the first molar tooth has a platform running round the outer side of the crown, whereas in the wolves it is reduced, or absent in the middle of its length. Careful investigation by Mr Gerrit Miller, of the United States National Museum, has shown that all domesticated dogs have the wolf type of first molar, which shows that they are directly descended from that stock.[1] It has remained for Professor Wood Jones, of the Adelaide University, to link up the dingo with this race.

"The examination of a series of dingo skulls," he writes, "leaves no doubt as to the true affinities of the Australian animal. The dingo falls into line with the other races of domestic dogs in being of the Northern wolf type. Moreover, in the large size of the carnassial teeth he approaches nearer to the ancestral type than to the other races of dogs of which I can obtain specimens or records."[2]

Reading the facts as we see them, we can get a fair idea as to whence the dingo came. Seeing that it apparently never got into Tasmania or Kangaroo Island, we must conclude that it came after the separation of these from the mainland and, presumably, after the Tasmanian aborigines were established in their island. From the fact that this dog was domesticated by the aborigines there is reason to conclude that it came to Australia with them—"at some period in that vague borderland of time where the geologically recent meets the historically remote." Though the bones of the dingo have been found in association with the remains of extinct Australian animals, it is quite possible for these elements to have become mixed without the animals actually having lived together.[3]

The term dingo came from the aborigine's name of contempt for the white man's dog. They called the wild dog the warrigal.

Dingoes were distributed all over the land, being just as much at home in forests as on the open plains of the interior. At present they are more numerous in the hilly timbered or scrubby country, where they can get cover. Notes made by careful observers point to the fact that there is a decided migration toward the coast in the winter and return in the summer. True dingoes are neither very fast nor sagacious, and a horseman can generally ride one down in a few miles. When cornered they show fight, but are fairly easily killed. In uninhabited country the dogs are often seen in the daytime, but when persecuted they take cover during the day and hunt at night, working singly or in pairs, or perhaps a pair with their grown pups will form a small pack in the late summer. They prefer to take the smaller animals, following their prey by scent, running until the pursued is exhausted and then killing. We have seen them on the Nullarbor Plain, travelling with noses to the ground, working quite silently, intent on surprising a bandicoot in the nest or picking up any small fry that might offer. When disturbed they trotted off for cover, and when fired at broke into a long, bounding gallop.

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[1] *Journal of Mammalogy*, i, 3, 1920, p. 149.

[2] *Tr. Roy. Soc. South Aust.*, xlv, 1921, p. 254.

[3] "The Warrigal, or 'Dingo,' Introduced or Indigenous?" R. Etheridge, Jun., *Mem. Geol. Survey New South Wales, Ethnol. Ser.*, 2, 1916, p. 44.

Dingoes do not bark, but emit a series of protracted, dismal howls, which may be kept up for a long time at night; this is usually an indication that they are near their lairs, and will not go far to lie up for the day.

From five to eight pups are born in the late winter, about August, though whelping may be later in the south than in the north. The size of the litter depends a good deal on the season; nine young have been noted, and as many as sixteen recorded. The young ones are reared in a hollow log, cave, or old rabbit-warren, especially one on a sandhill, but if nothing better offers they may be placed under a bush.

The chief natural enemies the wild dogs have to fear are eagles and large snakes. Carpet-snakes and pythons lying near the water-holes must often capture young dingoes. The large wedge-tailed eagles take especial toll of the pups. That they can kill full-grown dogs is vouched for by the late H. K. Bennett, a very keen observer of nature. His description of such an encounter is as follows: "I saw a pair of eagles kill a full-grown dingo. I did not see the commencement of the attack, but when I came across them they had evidently been at the dog some time, for it was very much exhausted, and was staggering about in an aimless manner. One eagle was perched on the dog's neck flapping its wings, and the other was perched on the loins.

Occasionally the dog would turn its head and snap feebly at the eagles, which would fly up and the next instant drop on the loins again. This continued for quite a while, the dog meanwhile getting weaker and weaker; finally it stumbled and fell, and lay perfectly still. The eagles walked round it, and then began tearing at its body with their bills. I waited for some time longer, and then rode up and found the dingo, which was in fine condition, dead." He mentions also that he has often found young dingoes in eagles' nests, the animals having been killed and taken as food for the young birds.[1]

The dingo readily crosses with the domestic dog, and at the present time, except in uninhabited country, pure-bred dingoes are rare. Before the introduction of sheep and cattle into the country the wild dog performed a rather useful service as the natural enemy of the kangaroo and the wallaby, preventing their becoming too numerous; but when the pastoralist killed off the native animals and replaced them with sheep the dingo took very kindly to them, and, because they were such easy game, often killed more than were actually required for food just for the lust of killing. The serious objection of the pastoralist to this slaughter has brought about a deadly enmity between himself and the dingo. Great losses may occur in timbered and hilly country, which affords the dingo some cover and protection. As previously mentioned, the pure warrigal is comparatively easy to deal with, and the domestic dog gone wild is also readily caught; but many of the crosses are exceedingly cunning; they seem to have learnt all there is to know about traps, poisons, and human beings' ways with animals generally.

The discovery of a dog quite different from the dingo in the mountains of New Guinea is of great interest. The New Guinea animal is a comparatively small black and white type, as far as external appearances go much more like some of our domestic dogs than any wild species. The late C. W. De Vis considered it to be the domestic dog of some previous inhabitants of the island.

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[1] *Aust. Mus. Spec. Cat.*, iii, 1, 1912, p. 205.

Mr A. S. Meek, when collecting for Lord Rothschild, found a small black and white dog, rather bigger than a terrier, fairly numerous on Goodenough Islands in 1896. He did not think that a white man had previously visited these islands.

DINGO, OR WARRIGAL

Canis dingo, Blumenbach. Australia. Gould, *Mamm. Aust.*, iii; Ogilby, *Aust. Mus. Cat.*, No. 16, *Mamm.*, 1892, p. 123.

A true dog specialized into even type, having rather long, coarse, tawny hair, with greyish under fur; top of head and dorsal region generally darker; under parts lighter; tip of brush-tail generally white; feet and chest may also be white, especially in Queensland animals; cheeks and outside of legs whitish tawny. (See Fig. 9.)

A white race, more or less suffused with tawny, exists in the south-west, and black specimens, with tan points and face, are often met with. Head and body, 715 mm.; tail, 350 mm.; height at shoulder, 530 mm.; ear, 90 mm.

NATIVE DOG OF NEW GUINEA (De Vis)

Canis familiaris, Linnæus. Mount Scratchley, probably highlands of New Guinea. *Ann. Qld. Mus.*, 10, 1911, p. 19.

Black and white animal, with comparatively small head and deep, narrow muzzle. Neck short, thick. Eyes slightly oblique. Ears short, erect. Hair short, closely adpressed, without under fur, longer on neck, forming ruff between shoulder and ear; general colour black and white, black predominant. Tail reaching middle of lower leg, rather bushy. Dew-claw absent. Head and body, 650 mm.; height at shoulder, 290 mm.

SEALS

ORDER CARNIVORA

SUB-ORDER PINNIPEDIA

In the seals we have a group of true carnivorous animals, especially adapted for living in the water by having feet resembling flippers or fins. Members of the group are found in Arctic, Antarctic, and temperate marine waters throughout the world, and one species inhabits Lake Baikal.

There are five species in Australasian waters. Three are local, the hair-seal, or Australian sea-lion, the Australian fur-seal, and the New Zealand fur-seal, or sea-bear. The sea-elephant, once found on King Island, in Bass Strait, is extinct there, and is not now found nearer to Australia than Macquarie Island. Two others are visitors in the winter from the Antarctic ; these are the sea-leopard and the beautiful white crab-eating seal. Although these two species may be fairly common at sea they rarely come ashore, and so are seldom seen by Australians.

FAMILY OTARIIDÆ

Eared Seals

The members of this group have the flippers large and well formed, and are able to move actively on land. The hind-flippers can be turned forward and used as feet.

The eared seals habitually congregate in herds, and are polygamous. The males exceed the females in size.

The sea-lion, the Australian fur-seal, and the sea-bear live on small islands, generally low reefs, lying in the open sea, which are difficult to approach, and which in heavy gales may be untenable even by their sea-loving inhabitants. The animals occasionally seek a resting-place on the mainland beaches.

Our two species of fur-seals are widely distributed, extending from Seal Rocks, off Port Stephens, to the vicinity of Albany, in Western Australia, and reach round the coast of Tasmania down to Macquarie Island, though in the latter place they are probably extinct. The sea-lion, or hair-seal, is found from the vicinity of Kangaroo Island, through the Great Australian Bight, round to the Houtmans Abrolhos, off Geraldton, Western Australia. In the Australian Bight two species are often found on the same island.

Mr W. R. Barwick, of Albany, states that in the Australian Bight there are no special haunts of the respective kinds. He further remarks: "I think that I am right in saying that every island and the adjacent mainland, from the Eastern Group to Eclipse Islands, off King George Sound, are at frequent intervals visited by both hair- and fur-seals. It is characteristic of these seals that their rookeries are situated on the wildest and most rugged parts of the coast, and adjacent to a number of small pools, which are used by the young to learn to swim, before venturing to the open sea."

The foregoing notes are confirmed by Mr James Grant, of Port Fairy, Victoria. In speaking of the fur-seal on Julia Percy Island he states: "The young are born in December and January, and are often found huddled together in groups of six or seven. They cannot swim, and if put into the water will soon sink and drown. They always take to the small pools in the rocks first, and I have often noticed them in the water playing with a piece of cuttlefish or derelict board."

Though our resident seals seem to inhabit their islands more or less all the year round, they certainly come ashore in greater numbers from November to January, when the pups are born. They then lose their timidity, and will defend their young. Mr J. F. Ramsbotham, Director of Lighthouses, states that "during this time the mothers are very ferocious, and it is sometimes difficult to get to the lighthouse structure; very often before landing the men have to be provided with sticks and clubs, with which to defend themselves."

There is no evidence that the Southern fur-seals make long migrations like the Northern species. We have noted that *Otaria cinerea* roams up and down the coast in small herds, visiting various islands. They seem to spend most of their time at sea.

From the little data that has been collected it appears that the chief food of our seals is squid, or cuttlefish, but they eat fish as well. Mr James Grant, of Port Fairy, Victoria, records having found sixteen salmon (large mullet) in one seal's stomach. He also states that they round up pilchards and whitebait, as a dog would sheep, and go through them until surfeited. Young seals are unable to take solid food for many months after birth, and it has been found impossible to rear them by hand. A seal requires from 10 to 20 lb. of fish per day.

Both hair- and fur-seals live in herds and are polygamous; we have noted immense harem bulls (*Otaria cinerea*) looking after groups of up to twenty-five females on Seal Rocks. These males were very active, and fully imbued with their responsibility, and were continually parading round to keep off rivals.

The ordinary call of the fur-seal is a prolonged deep-throated sound, which may be heard for a considerable distance. Besides this they make a variety of noises, the most frequent being a series of short barks, produced when fighting or by the female when driving off a too persistent pup. The call of the young sea-bear is a high-pitched bleat, while the voice of the young sea-lion is a hissing growl, rising to a series of yelps.

Seals swim with a beautifully easy motion, using the fore-flippers. When going fast the whole body is brought into play, with an undulating movement, and the pace at which they can travel is extraordinary. They often bound out of the water like porpoises.

When lying in the water at rest they often have one flipper held high in the air, or the two hind-flippers will be brought forward and grasp one fore-limb. These are perfectly easy positions and the natural way of resting on the surface, and enable them to keep the body head on to the wind and sea. They frequently lie on their backs in the sea and wash their faces, using both flippers. When a herd is fishing individuals frequently rise half out of the water and shake their heads.

We have no direct evidence that our seals have any enemies, but it is very likely that killer-whales and sharks take toll. The latter are reported by Mr W. H. Williams, head lighthouse-keeper at Montagu Island, to be especially numerous both at that island and off Seal Rocks, and he is of opinion that they take the young ones before they are active enough to keep out of the way.

There are several records of seals having been seen in rivers and lakes. These are evidently the mythical 'bunyips' of the aborigines. Mr Darcy reports having seen "an animal like a big retriever dog, with a round head and hardly any ears," in Lake Corangamite, in 1872. This was evidently a sea-bear. He also reports having seen an animal like a seal in the Big River, a tributary of the Goulburn. Many people saw a seal in Lake Burrumbeet, near Ballarat.[1]

FAMILY PHOCIDÆ

EARLESS SEALS

The earless seals are so completely adapted for an aquatic life that their flippers cannot support the body on land, but act as swimming organs only. The hind-flippers are fixed in a backward position. They have no visible external ears. Although completely at home in the water, they are at a disadvantage on the land, where they can only shuffle along with a caterpillar movement. The members of this group are found singly, and are not polygamous.

From the fact that the sea-leopard stays at sea for many months at a time, and is apparently only driven ashore in

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[1] *Geelong Naturalist*, v, 2, January, 1896, p. 16.

Australian regions by very heavy weather, we may infer that it is probably much more numerous in our waters than its recorded appearances indicate. Those found on the beaches are often very much exhausted or injured. After a severe gale, lasting over a fortnight, in August 1921, one specimen came ashore near Sydney, two at the mouth of the Shoalhaven River, one at the mouth of the Snowy, one at King Island, and another at Montagu Island. These happen to be inhabited spots, where they could be observed, and we presume that a great many more landed where they were not seen. The first one had been terribly injured in a fight with another seal or a shark, and the others were so exhausted that they could not regain the water when approached. As their home is in the Antarctic, and the nearest permanent bases are in Macquarie Island and South Victoria Land, they must be capable of travelling immense distances.

The feeding habits of this seal are very different from those of other members of the group. It is truly the Leopard of the Waters, and down among the pack-ice of Antarctica and round Macquarie Island it lives chiefly on penguins, sea-birds, and doubtless the young of other seals. Feathers and bones of shearwaters were found in the stomach of one that was captured near Sydney. One kept in Taronga Park fed on ducks, whose strange disappearance mystified the attendants until the offender was caught in the act.

In this connexion we have one of the most remarkable nature notes ever recorded in the life-history of our seals, for Krefft states that, in 1870, a male sea-leopard ten feet long was taken in the Shoalhaven River, south of Sydney, with a full-grown platypus in its stomach. This is proof that this animal must have gone up the river into fresh water. Here, then, we have an example of a creature belonging to the Antarctic fauna, and usually found in the open sea, brought into close proximity with one of the most primitive native animals occurring in inland Australia, an association of forms which, if found embedded together in a fossil state, would prove a fine puzzle for the palæontologist.

This species is usually found singly, and is monogamous. Shackleton, in his book *The Heart of the Antarctic*, gives the following note: " We only saw two sea-leopards during the whole of our stay in the Antarctic. The first was seen soon after the sun left us, and Joice went down to kill it, as we were in need of meat and blubber; but when he got close to it he found what the animal was, and came running back for a pistol, for this species is savage and aggressive, and can move rapidly on the ice."

The crab-eating seal is another visitor from the remote South, and by far the rarest in our waters. Its nearest known breeding-place is the pack-ice of the Antarctic continent. Shackleton says: " This species can move much faster on ice than the Weddell seal. When not frightened it progresses in the same way as the Weddell, by arching its back, caterpillar-fashion, very rapidly. A crab-eater can hold its own against one dog, though it might be overcome by several. It turns very smartly, and frequently makes a feint of turning in one direction, and then makes a sudden turn and snap in another, drawing its head close down to the shoulders, and then shooting it out as the sea-leopard is said to do."

The sea-elephant used to exist on King Island, Bass Strait, but it was exterminated about the year 1803.

One of the first industries established in Australia was in connexion with the securing and selling of sealskins and oil. In 1798, when Flinders and Bass set out from Port Jackson in their little Norfolk-Island-built sloop of 25 tons to settle the question as to whether Tasmania was an island, they were accompanied by the *Nautilus*, a vessel of 60 tons, as a sealing consort. Flinders' previous voyage to Preservation Island had shown the possibilities of the Strait for sealing, and he piloted the first schooner to her fishing-grounds. The result of this first venture among the Bass Strait seals was a cargo of 6000 skins and several tons of oil.

This started a period of ruthless and heedless destruction. American and French vessels, attracted by the value of the sealing-grounds, came for their share of the spoil, and in 1805 ten vessels and 180 persons were scattered among the islands in small groups, employed in catching seals. It was estimated that in the ten years between 1800 and 1810 the number of seals killed in the Bass Strait archipelago was 240,000. However correct this figure may be, it is certain that the industry was blighted, and has never recovered, and the sea-elephant was exterminated in this area.

Our remaining seals are under the protection of the states, but without machinery for supervision, or co-ordinate action, the protection is more nominal than real (up to 1925). With care and uniform action this valuable industry could be re-established, just as it was in the Pribilof Islands. When the United States Federal Government stepped in and took control there were but 125,000 seals left out of a herd of about three millions; their number has now increased to 600,000. About 40,000 surplus males are killed annually; in 1920 14,852 dressed skins were sold on Government account for 1,707,071 dollars. The herd is increasing at the rate of 8 per cent. per annum.

AUSTRALIAN SEA-LION

Eumetopias albicollis, Peron (*Zalophus lobatus*, Gray). Islands of South-west Australia, from vicinity of Spencer's Gulf to Houtmans Abrolhos. Ogilby, *Aust. Mus. Cat.*, No. 16, *Mamm.*, 1892, p. 126; Gould, *Mamm. Aust.*, iii, Pl. 49.

Adult male: general colour dark brown, darker posteriorly and on belly; individual hairs brown or grey, evenly coloured throughout; yellow patch on crown and back of neck; face darker, nose and lips yellowish fawn, edged with a darker band; extremities of flippers slate grey. Length, 7 feet.

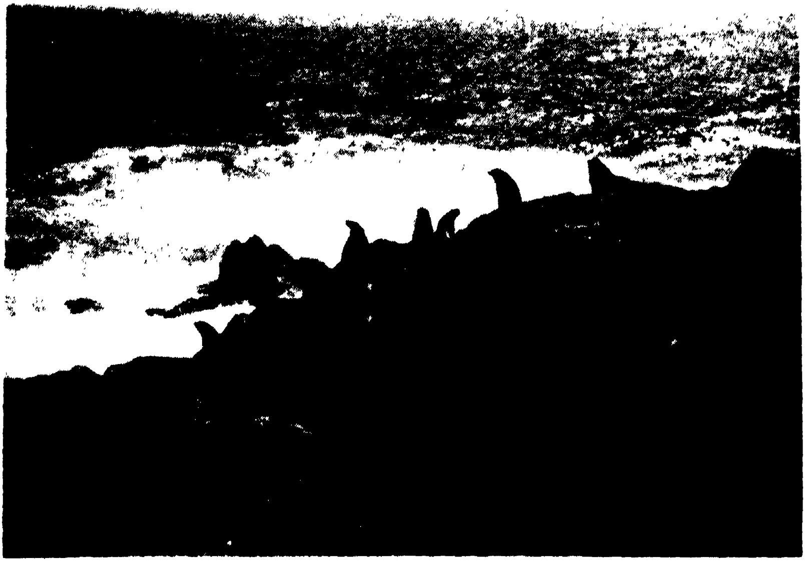
Female and immature: general colour fawn brown on back; belly brown; sides of face, neck, and the chest yellowish fawn, a darker line from nostrils round mouth; individual hairs evenly coloured, except on back, where they may be tipped with fawn; many silvery hairs mixed with the dark ones; no under fur. Length, 5 feet. (See Figs. 10 and 11.)

10. Australian Sea-lions (*Eumetopias albicollis*), Mother and Young

11. Sea-lion at Sea

Photo W. W. Walker

12. Australian Fur-seal (*Arctocephalus doriferus*), Male



13. Australian Fur-seals (*Arctocephalus doriferus*), Montagu Island

AUSTRALIAN FUR-SEAL

Arctocephalus doriferus, Wood Jones (*Otaria cinerea*, Peron). South-eastern Australian seas. *Rec. South Aust. Mus.*, iii, 1, 1925, p. 12; *Zoology of Challenger*, xxvi, 68, 1887, p. 79.

General colour above brown or fawn brown, with cheeks, neck, chest, and flanks greyish or fawn; crown darker; belly and base of flippers dark chestnut. Male darker than female. Individual hairs in adults grey at base, black in centre, and more or less tipped with fawn; under fur soft, dense, and pale fawn in colour. Some specimens may be grey all over, with base of flippers and belly chestnut. Male, from tip of nose to tip of tail, 5 feet 6 inches; female, from tip of nose to tip of tail, 4 feet 9 inches. Descriptions taken from specimens from Julia Percy Island, Bass Strait. (See Figs. 12 and 13.)

An aged male from Montagu Island, New South Wales, had over hair rather stiff; general colour dark brown all over; under fur reddish brown, and rather sparse. Length, from tip of nose to end of hind-flipper, 8 feet 9 inches. A female was wood brown all over, with soft dark brown under fur, and measured 5 feet from nose to end of hind-flipper.

NEW ZEALAND FUR-SEAL

Arctocephalus forsteri, Lesson. Southern New Zealand and southern Australian seas. *Zoology of Challenger*, xxvi, 68, 1887, p. 87.

General colour above, including throat and thorax, grizzled grey; individual hairs grey or black with grey tips. Belly chestnut brown, base of flippers black; dark grey spot beneath eye. Under fur fine, dense, and pale fawn in colour. Length, adult males from 6–7 feet; adult female, 5–6½ feet. Descriptions taken from New Zealand examples.

One from King Island, and two from Recherché Archipelago, females, were buffy grey above, the colour being warmer posteriorly and on the flanks; the belly was more or less washed with brown; flippers black, the fine velvety hair on the broader parts being vandyke brown. Under fur soft, dense, and pale fawn in colour. The length, from nose to tip of tail, was from 3 feet 3 inches to 4 feet.

LEOPARD-SEAL, SEA-LEOPARD

Ogmorhinus leptonyx, Peters. Antarctic seas, southern Australian seas in winter. *Zoology of Challenger*, xxvi, 68, 1887, p. 64.

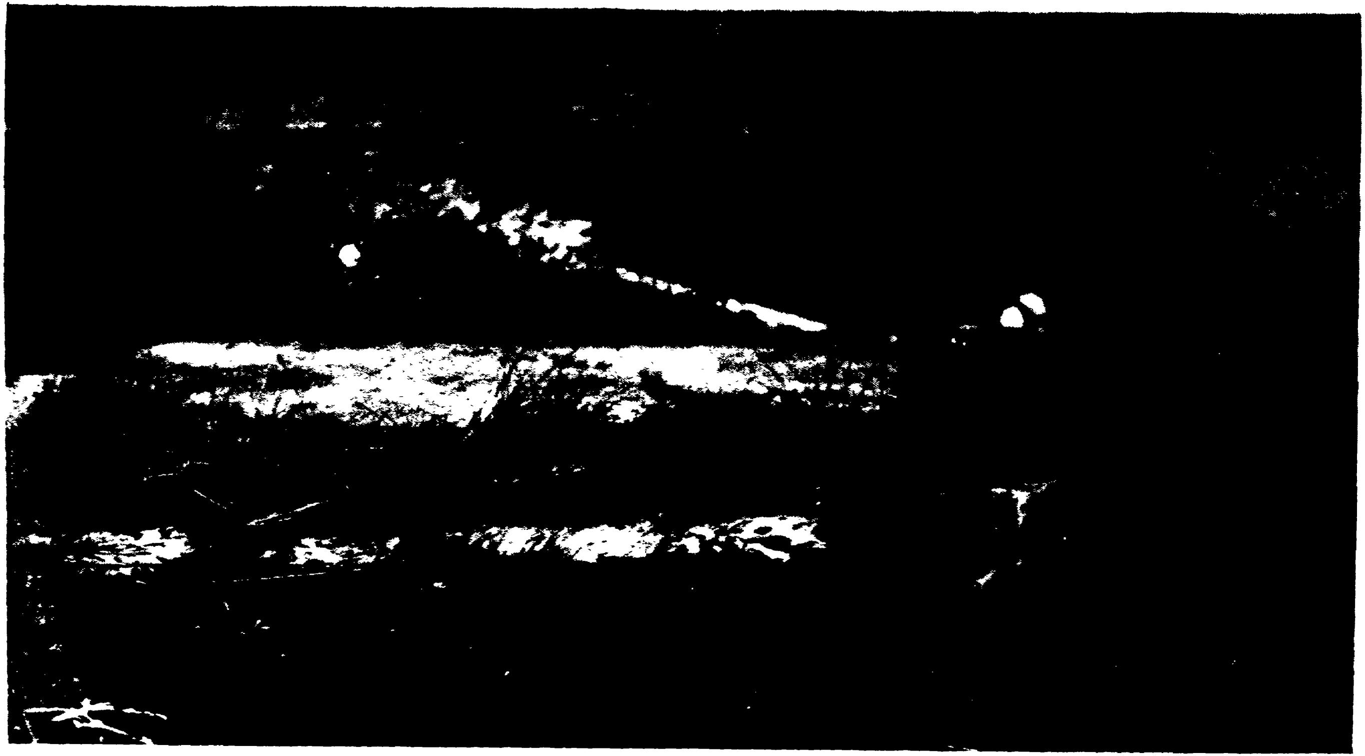
Upper surface ashy grey, sometimes marked with lighter patches, and more or less spotted and blotched with black; under surface creamy white, blotched and spotted with black, especially near head and tail. Males, 10–12 feet; females, 7–8 feet. (See Fig. 14.)

CRAB-EATING SEAL

Lobodon carcinophaga, Hombron and Jaquinot. Antarctic seas, southern Australian seas in winter. *Zoology of Challenger*, xxvi, 68, 1887, p. 71.

Form long and slim, tapering off gradually from shoulders backward. Neck long, merging gently into head, which has elongated appearance from lengthening of snout. Hair silky and soft. General colour in autumn warm brownish grey; darker mid-dorsally, with brown spots and rings to great extent confluent over body, except on flanks, shoulders, sides of head, and neck; colour changes to creamy white in winter, and spots fade to indistinguishable buff through bleaching. Length, 9 feet.

This seal is most easily recognized by the structure of its teeth, each of which has several lobes, forming a sieve when the jaws are closed through which the water is ejected, while the mud and small crabs are retained and swallowed.



14. LEOPARD-SEAL (*Ogmorhinus leptonyx*), FEMALE

SEA-COWS

ORDER SIRENIA

MARINE animals adapted for feeding on sea-grass, having a round head, horizontally expanded tail, and short, paddle-shaped flippers without any nails.

DUGONG

Genus Halicore, Illiger

Incisors in male tusk-like, with bevelled cutting edges (these are not visible in female); three molars in each ramus. Head in front of eyes bent abruptly downward.

The shallow seas and estuaries bordering the coasts of most tropical countries contain these curious marine herbivorous animals. The Australian species has a wide distribution, being found from Moreton Bay round the north coast to Broome, through the Malay Archipelago and Indian Ocean, and on the coasts of Africa. Their bones have been found in Botany Bay, indicating that they at one time came farther south.

Quiet, inoffensive, and rather slow of movement, the dugong lives in the shallow reaches; a favourite haunt is about the islands of the Great Barrier Reef. If the sea be smooth it may be seen coming to the surface for air, and an oily appearance on the surface will denote its course under the water. Fragments of floating grass (*Posidonia australis*), upon which it exclusively feeds, may also indicate the animal's marine pastures. Dugongs live in pairs or herds. The late E. J. Banfield, who from his retreat on Dunk Island (off the Queensland coast) had good opportunities for observing them, states: " When a herd frolics in the water, rising in unison with graceful, undulatory movements for air, and the sunlight flashes in helioscopic rays from wet backs, the spectacle is rare and fine ; rolling and lurching along, gambolling like good-humoured children, the herd moves leisurely to and from favourite feeding-grounds, occasionally splashing mightily with powerful tails to make fountains of illuminated spray—great, unreflecting, sportful water-babies."

Usually only one young one is born at a time ; Banfield reports having once seen twins. The babe is held to the breast with a flipper while suckling, and the animal when reclining on the surface is rather human-like, which has probably given rise to the stories about mermaids.

The flesh of the dugong is delicious, and should be treated like bacon ; it has a specially sweet and attractive flavour, and is most nutritious. The oil is said to be of great value medicinally, though probably it is not different from other animal fats. We think that dugongs offer an economic field that should not be neglected. Their grazing-fields are never subject to drought or change. At present they inhabit a No-man's Land, and are being killed off by Japanese trepang-fishers under little or no supervision. Banfield further states : "Dugongs are certain of extinction, as all their haunts are ruthlessly ravaged." They should be just as carefully preserved as our domestic animals.

DUGONG

Halicore dugong, Gmelin. From Moreton Bay round northern coast of Australia to Broome on the west coast (extralimital). Ogilby, *Aust. Mus. Cat.*, No. 16, *Mamm.*, 1892, p. 63.

General form of body depressed and fusiform. Forelimbs paddle-shaped. Tail flattened and horizontally expanded. Skin thick, smooth, with few hairs. Upper lip large, its lower edge obliquely truncated and bristly. General colour above slaty black. Length, to 8 feet.

RATS AND MICE

ORDER RODENTIA

THE Rodentia, the largest of the mammalian orders, is practically cosmopolitan. It contains many interesting, though fairly uniform, animals, which are easily distinguished by having two pairs of cutting incisor teeth.

In Australasia (including New Guinea and the East Indian islands, which are in the same zoological group) we have upward of one hundred species. They all belong to the family Muridæ, and may roughly be divided into three groups—water-rats, terrestrial rats and mice, and jerboa-rats. Generally speaking, the water-rats and terrestrial rats are more or less coastal, or inhabit the better kind of country, while the jerboa-rats and most of the mice are more at home in the drier inland districts.

There are also the rabbit, hare, black rat, brown rat, and the European mouse, which have been introduced. These have occupied most of the country suited to their habits and requirements.

The various species of rats and mice are rather difficult to distinguish. Different genera may be exactly alike externally, and yet have distinct differences in the teeth and skull. As external characters are more apt to vary than the dentition, it is to the teeth and skulls that we look for family and generic differences, while colour, character of the hair, and measurements play a more important part in the determination of species.

Owing to their omnivorous diet, and to their taking much the same kind of food as man and his domestic animals, rodents are looked upon as pests; especially is this so since it has been discovered that they carry diseases communicable to man. The great majority of native Australian species, however, are harmless. Only one native rat, as far as we know, exhibits the swarming propensities so well known in this order throughout the world. Most of our troubles in this respect come from the imported mouse, *M. musculus*.

Under ordinary circumstances the numbers of any species are regulated by the food-supply and natural enemies. Occasionally, following a dry time, when natural enemies are much reduced, a series of good seasons with mild winters causes an abundance of food, and breeding may be almost continuous. Under these circumstances certain species will increase out of all proportion to the natural conditions. An especial cause of the increase of the common mouse in the wheat areas is to be seen when, for various reasons, much of the crop goes down, and is left in the fields. This happened in the 1917–18 season, and was the principal reason for the large increase of *M. musculus* in the following year.

The increase goes on until the food begins to fail, when the swarms move off in a given direction, probably against the prevailing wind, to find fresh supplies. In the battle for existence the weakest fail. The foremost of the horde, the stronger males, do fairly well, but there is nothing left for the late-comers, chiefly the females and young, which, driven mad by hunger, fight desperately among themselves. Cannibalism is rife, and the plague really eats itself out. This accounts for the almost complete disappearance of a species within the space of a few months, and for the fact that it is sometimes difficult to find a single specimen where a short time before there were millions.

It is interesting to note the great disparity in the numbers of the sexes which sometimes occurs in these swarms. There is some reason for thinking that abundance of food and easy conditions produce a preponderance of females, while starvation and stress have the opposite effect. A letter from Mr S. T. D. Symons, formerly Chief Inspector of Stock for the State of New South Wales, illustrates this point. He states that "following your recent interview with me on the subject of the sexes of the mice which have lately been a plague in country localities, I am now in receipt of information from Mr J. F. Crossley, of Pine Ridge, Quirindi, who examined 692 mice, out of which a total of 487 were females." This is confirmed by Mr R. A. Pratten, manager of the North Bangaroo Stud Farm, Canowindra, who states that, as far as he can judge, the female mice outnumber the males to the extent of six to one. When the swarms are travelling this proportion of the sexes is changed, and for the reasons mentioned above the males far outnumber the females.

An interesting account of the swarming of the long-haired rat (*R. villosissimus*) is given by Mr Benjamin Hore, of Torrens Creek, North Queensland. He saw these rodents migrating in thousands in April, May, and June of 1907. They came from the north and west, and were travelling south and south-east, moving at night in vast droves. They came from the Flinders River, below the towns of Hughenden and Richmond, extending out of Winton and the Diamantina River, thus being spread over a front of 150 miles. "We had a cat that used to kill five or six every night; they all belonged to the male sex. Many which I found lying about dead in the bush, from no apparent cause, were also males. They were followed by a swarm of wild domestic cats and by a lot of dingoes from the rough ranges of Torrens Creek."

Mr Sidney W. Jackson also met with this species in numbers when camping on the Diamantina in 1918, and he kindly sends the following information: "I met with the vast numbers of rats (*R. villosissimus*) in July and August 1918. Over 600 were killed at my camp, and all were males. They were eating each other, and I think the females went first. They lived in numerous huge cracks in the ground during the day, and only came out at night. They were eating grass-seeds, and flowers of various low shrubs and flowering plants. They appeared to be travelling due south, cutting the grass down level with the ground as they went. I killed 40 or 50 of them one night, and next morning only the tails were left, the other rats having feasted on them."

Among our Australian Muridæ are several specialized forms, notably the water-rats of the genera *Hydromys* and *Parahydromys*, which have a peculiar dentition. Also of interest are the broad-toothed rats (*Mastacomys*) and the jerboa-rats, some of which carry their young on the teats like the marsupials, although they have no pouch. Some rats found in New Guinea are the largest in the world (*Mallomys*). Others have prehensile tails.

Key to Genera of Muridæ

(Tail scaly, more or less naked; no cheek-pouches)

SUB-FAMILY HYDROMYINÆ

WATER-RATS

1. Two molars in each jaw, with transverse laminæ	
Toes partially webbed	
Tail short-haired, distal part white	*Hydromys*
Tail with white fringe	*Crossomys*
Tail with white brush of hair at end	*Parahydromys*
Toes not webbed	
Tail scaly, finely haired, evenly coloured	*Xeromys*
2. Three molars in each jaw, with transverse laminæ	
Tail short, brown above, white below, tip white	*Leptomys*

SUB-FAMILY MURINÆ

TYPICAL RATS

3. Three molars in each jaw, with three series of cusps across each. Tail ringed with overlapping scales, nearly naked	
Molars broad, each anterior molar more than half as broad again as the palatal space between them. Mammæ, 4. Tail clothed with dark brown hairs. Tasmania	*Mastacomys*
Molars normal. Mammæ, 6–12	
Tail lightly haired	*Rattus* (*Epimys*)
Tail naked. Body hair rather woolly. Solomons	*Cyromys*
Tail hairy. Metatarsus lengthened. Feet slender. New Guinea	*Stenomys*
Tail with apical three-quarters yellowish white. Fur coarse. New Guinea	*Anisomys*

Tail coarsely scaled, almost naked	
Fur long, thick, soft. Head and body over 400 mm. New Guinea . .	*Mallomys*
Fur long, harsh. Head and body under 400 mm. New Guinea . . .	*Hyomys*

Prehensile-tailed Rats

Tail without scales terminally, prehensile .	*Pogonomys*

Australian Mice

Tail lightly and evenly haired. Mammæ, 4	*Pseudomys*

European Mouse

Tail lightly and evenly haired. Mammæ, 10	*Mus*

Jerboa-rats

Hind-limbs and ears long. Mammæ probably 4 only. Feet broad, with 6 pads	
Tail well tufted in black and white. Fur spiny, harsh. Feet broad . .	*Conilurus*
Tail heavily tufted, jerboa-like. Feet narrow	*Mesembriomys*
Tail lightly haired, pencilled terminally .	*Zyzomys*
Tail thickened basally. Fur crisp . .	*Laomys*
Tail evenly haired, tufted in *L. apicalis* only. Hair soft	*Leporillus*

Kangaroo-mice

Hind-limbs, tail, and ears very long. Feet slender, with four or less pads	
Head and body over 100 mm. Australia	*Notomys*
Head and body about 85 mm. New Guinea	*Lorentzimys*

Mosaic-tailed Rats

Tail with scales set on edge, forming mosaic work	
Hind-foot, 52 mm. and upward. Tail tipped white	*Uromys*
Hind-foot less than 43 mm. Tail not tipped white	*Melomys*

Tail black, tip smooth and shining above.
Solomons . . . . . *Solomys*

Note.—For full references see "List of Australasian and Austro-Pacific Muridæ," Longman, *Mem. Qld. Mus.*, v, 1916, p. 23.

FAMILY MURIDÆ

SUB-FAMILY HYDROMYINÆ

WATER-RATS

Genus Hydromys, Geoffroy

Large, strong rats. Head and body about 12 inches in length. Colour of body dark above and white below to orange, but very variable; distal part of tail white. Feet partially webbed. Muzzle somewhat flattened above, not pointed, clothed at tip with long hairs. Ears small. Two molars in each jaw divided into transverse laminæ.

The water-rats are found practically all over Australia, Tasmania, and New Guinea—wherever there are streams, swamps, backwaters, or estuaries that will provide the aquatic environment for which they are specialized.

They live in banks, fallen logs, or on heaps of *débris*; the entrance to their retreat is indicated by a small circular hole. During the late afternoon or evening an observer may see them swimming about, gathering their food. This chiefly consists of mussels and crustaceans, but they will take any fish or meat diet that comes their way. A peculiar habit of *Hydromys* is that they take all their food to a stone, log, or clean place to be eaten—a dining-table in the midst of the waters. A family seen in a small backwater of the Snowy River had as their base a large stone, from which they frequently dived after bull-frogs. Working at night and chiefly under water, they have an extraordinary array of sensitive whiskers, as will be seen in Fig. 16.

Mr F. C. Morse, of Garah, New South Wales, has given the following account of the water-rat as he saw it in the Macquarie swamps: "Its home is usually in a hollow log, where it builds a cosy nest of shredded weeds. When a

15. South-eastern Water-rat (*Hydromys chrysogaster*

16. Head and Whiskers of Water-rat (*Hydromys chrysogaster chrysogaster*)

17. European Black Rat (*Rattus rattus*)
See p. 118.

18. Dusky-footed Swamp-rat (*Rattus fuscipes*)
See p. 120.

suitable log is not available it will make a dwelling by burrowing into an old swan's nest, raising the centre into a kind of dome. An escape hole is always framed from the bottom of the nest, leading directly into the water, so that Mrs Rat is never caught unawares. This little animal not only catches young ducks and other small birds, but will also kill fully grown ones. One day while resting after a long tramp in a swamp, I noticed a water-rat swimming along, dragging a coot after him. On being disturbed he dropped the bird and dived away. It was a full-grown bird, dead, but only newly killed; examination showed a bite at the back of the head severing the spine."

On the rivers the water-rats' habits are somewhat different, as they naturally make their strongholds under the banks. Here one will at times find their burrows running parallel with the banks and connected with an outer and inner chamber; the inner one is a comfortable sleeping-room, measuring usually 6 by 4 by 9 inches high, and containing a nest composed of bark, twigs, grass, etc. The outer excavation is evidently used as a pantry, for it is full of bones and shells.

The breeding-burrow is rather more elaborate, and much longer. One located on the Namoi River had a rounded entrance, about 3 inches in diameter, just 4 feet above the normal level of the stream. The tunnel, gradually rising from the entrance in the steeply sloping bank, was 17 feet to the nesting-chamber in a straight line, with a recess cut in one side about 8 feet from the opening. From the nesting-site the hole led to a second excavation of rather smaller size, and finally terminated in an exit and ventilating opening on the surface. This measured only 2 inches in diameter, and was hidden by grass. The nesting-chamber measured 7 by 9 by 9 inches high.

SOUTH-EASTERN WATER-RAT

Hydromys chrysogaster chrysogaster, Geoffroy. South-eastern Australia and Tasmania. Gould, *Mamm. Aust.*, iii, Pl. 24.

General colour above and basal half of tail grizzled black and buff, former colour predominating; sides of face and body, entire under surface, and inner sides of limbs deep reddish orange; outer surface of limbs deep brown; upper surface of feet pale glaucous buff, passing into brown on tips of toes; apical half of tail white. Head and body, 315–322 mm.; tail, 272–315 mm.; hind-foot, 70–77 mm. (See Figs. 15 and 16.)

CENTRAL AUSTRALIAN WATER-RAT

Hydromys chrysogaster fulvolavatus, Gould. Interior, from River Murray to Arnhem Land. Gould, *Mamm. Aust.*, iii, Pl. 25.

General colour above orange buff or buffy brown, but numerous black hairs, disposed over upper surface, give these parts a dusky hue; under surface dull white; outer surface of limbs dark brown, deepening toward toes; whiskers mixed black and white; tail black with white tip. Size a little smaller than eastern form.

QUEENSLAND WATER-RAT

Hydromys chrysogaster reginæ, Thomas and Dollman. Burdekin River, North Queensland. *Proc. Zool. Soc.*, 1908, p. 789.

General colour dark greyish, slightly darker along dorsal line; under surface white tinged with buff; tail black, white terminally. Head and body, 336 mm.; tail, 320 mm.; hind-foot, 66 mm.; ear, 19 mm.

WESTERN WATER-RAT

Hydromys fuliginosus, Gould. South-west Australia. Gould, *Mamm. Aust.*, iii, Pl. 27.

Upper surface mingled buffy brown and black, latter predominating, producing deep sooty appearance, especially along back; whiskers and face black; tail blackish with apical inch and a half white; under surface pale greyish brown; outer surface of limbs dark brown. Size same as in *H. chrysogaster*.

North-western Water-rat

Hydromys caurinus, Thomas. North-west Australia (Kimberley district). *Ann. Mag. Nat. Hist.*, (8) iv, 1909, p. 197.

General characters much as in *H. c. reginæ*, but of a much clearer grey, without a yellowish or fulvous suffusion; general colour above blackish grey, the light element in colour dull white; under surface dull creamy white; top of muzzle blackish; hands with digits dull creamy white, with dark patch on metacarpals; hind-legs and feet dark brown throughout; terminal part of tail white. Head and body, 284 mm.; tail, 272 mm.; hind-foot, 61 mm.; ear, 20 mm. This water-rat is of a much clearer and less yellowish grey than any other *Hydromys*.

New Guinea Water-rat

Hydromys esox, Thomas. Southern New Guinea. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 324.

General colour above mummy brown; sides more buffy, passing into dull whitish lower parts, which are strongly suffused with brownish-salmon shade; top of head black; muzzle quite black, as is small patch on ears, which are almost naked; back of legs brown; front and top of feet whitish; distal part of tail white. Head and body, 295 mm.; tail, 225 mm.; hind-foot, 50 mm.; ear, 15 mm.

Kei Island Water-rat

Hydromys beccarii, Peters. Kei Island, New Guinea. *Ann. Mus. Civ. Genova*, xvi, 1881, p. 706.

General colour above brown; darker on head, cheeks, and muzzle; flanks brownish fawn; under sides whitish; end of tail white. Head and body, 255 mm.; tail, 230 mm.; hind-foot, 55 mm.

MELVILLE ISLAND WATER-RAT

Hydromys melicertes, Thomas. Melville Island. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 430.

Apparently a small island form of *H. caurinus*. Size and appearance very much as in *H. nauticus*. Colour rather greyer than hair-brown; crown and median dorsal area not specially darker; sides lighter grey; under surface pale olive grey, the hairs pale grey for the greater part of their length, with their tips slightly buffy, hands and feet dark brown; tail with proportions of black and white as in *H. nauticus*. Head and body, 232 mm.; tail, 206 mm.; hind-foot, 54 mm.; ear, 20 mm.

ARU ISLANDS WATER-RAT

Hydromys nauticus, Thomas. Aru Islands. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 429.

General colour above dark greyish brown, near hair-brown; middle dorsal area more blackish; quite black on forehead, crown, and nape; sides greyer; under surface drabby, the hairs pale slaty at the base, with pinkish-buff ends; hands pale brownish; feet almost naked, their fine hairs dull whitish; tail, as usual in northern forms of genus, with nearly half of short-haired portions white. Head and body, 265 mm.; tail, 215 mm., its terminal white portion, 79 mm.; hind-foot, 50 mm.; ear, 22 mm.

Genus Crossomys, Thomas

A highly specialized aquatic form. Ear-conches practically absent. Fingers free. Toes webbed, with claws both before and behind, small, delicate, and strongly curved. Hind-feet broad; sole-pad broad and smooth. Tail provided with strongly marked swimming fringe below, fringe bifurcating into two lateral ridges on proximal part of tail. Dentition as in *Hydromys*; upper incisors considerably bevelled laterally.

MONCKTON'S WATER-RAT

Crossomys moncktoni, Thomas. North-east Papua, 4500 feet. *Ann. Mag. Nat. Hist.*, (7) xx, 1907, p. 70.

Fur thick, soft, woolly, glossy, comparatively scarce longer hairs on back being about 18 mm. in length. General colour above grey, washed with pale yellow olivaceous; longer hairs with black tips and isabelline sub-terminal rings; woolly hairs silvery white for seven-eighths of their length, with tips black; under surface silvery white; line of demarcation well marked high up on sides; narrow line down from front of arms like back, rest white; upper surface of hands pale brown, fingers naked; tail grey throughout on short-haired part; swimming fringe white. Head and body, 205 mm.; tail, 220 mm.; hind-foot, 48 mm.

Genus Parahydromys, Poche

Less specialized for aquatic life than *Hydromys*. First and last toe with practically no webbing; webbing between second and third, third and fourth, narrower, not reaching half-way along toes; fifth toe without claw, reaching nearly to end of basal phalanx of fourth. Surface of soles smooth and very slightly granulated; pads distinct. Distinct brush of hair at end of tail. Teeth as in *Hydromys*.

Parahydromys asper, Thomas. Richardson Range, Papua, from 2000 to 4000 feet. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 325.

Fur coarse, harsh. General colour above coarsely grizzled grey brown; ends of longest hairs black, those of shorter ones dull creamy white; under fur glossy whitish at base, slaty brown terminally; lower surface dull greyish, washed with buff. Whiskers very long and numerous, upper ones black, lower ones white. Ears short, rounded, finely haired, greyish brown. Upper surface of hands and feet pale brownish. Tail with distal half white. Head and body, 240 mm.; tail, 260 mm.; hind-foot, 54·5 mm.; ear, 15 mm.

Genus Xeromys, Thomas

Terrestrial, but dentition as in *Hydromys*. External form murine. Tip of muzzle as in *Mus*. Toes not webbed. Tail scaly, finely haired.

THOMAS'S RAT

Xeromys myoides, Thomas. North Queensland. Ogilby, *Aust. Mus. Cat.*, No. 16, *Mamm.*, 1892, p. 102.

External appearance very like ordinary rat. Fur very short. General colour above dark slaty grey; under surface white. Ears short and rounded; laid forward they do not reach to within 3 or 4 mm. of posterior canthus of eye. Hands and feet very thinly haired; white. Palms and soles naked, former with five, latter with six, pads; last hind-pad elongate. Tail slender, scaly, covered with fine white hairs. Head and body, 110 mm.; tail, 154 mm.; hind-foot, 40 mm.; ear, 20 mm.

Genus Leptomys, Thomas

Form murine. Tail short. Hind-feet long. Mammæ, 4. Molar structure as in *Hydromys*, but 3—3 in number.

ELEGANT RAT

Leptomys elegans, Thomas. Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 610.

General appearance like *U. levipes*. Fur close, soft, and velvety. General colour rufous fawn, browner on back, especially anteriorly; shoulders, flanks, and hips bright rufous; face darker; upper side of muzzle black, extending backward to form indistinct ring round eye; cheeks, inner side of arms, and under surface, from chin to anus, creamy white; hairs evenly coloured to bases; upper surface of hands and feet thinly haired, white. Ears rather small, naked. Five sole-pads on forefeet and six on hind. Fifth toe reaching only to base of fourth. Tail finely scaled, 16 to cm.; basal three-quarters brown above, white below,

tip white all round. Head and body, 162 mm.; tail, 154 mm.; hind-foot, 40 mm.; ear, 20 mm.

SUB-FAMILY MURINÆ

TYPICAL RATS

Three molars in each ramus, *with three series of cusps* across each. Tail scaly, more or less naked. This subfamily contains a great number of species, which vary a good deal in size and in external characters.

Genus Mastacomys, Thomas

Like *Rattus*, but with molars extremely broadened, and of somewhat different pattern, having fewer laminæ.

BROAD-TOOTHED RAT

Mastacomys fuscus, Thomas. Tasmania. *Ann. Mag. Nat. Hist.*, (5) ix, 1882, p. 413.

Fur extremely long and soft. General colour dark greyish brown above and below; hairs bluish slate for greater part of length, with tips light brown above and nearly white below; ears coloured like back; tail and upper side of feet clothed with dark brown hairs; skin of both tail and feet very dark coloured. Fifth toe just reaching base of fourth. Five sole-pads on forefeet and six on hind. Ears rather large. Mammæ, 4. Head and body, 145 mm.; tail, 95 mm.; hind-foot, 30 mm.; ear, 96 mm. (The anterior molars are each more than half as broad again as the palatal space between them.)

Genus Rattus, Fitzinger (*Epimys*, Trouessart)

Incisors not grooved. Molars with three series of cusps across each. Eyes and ears large. Thumb with short nail instead of claw. Tail long, nearly naked, with rings of overlapping scales. Mammæ, from 6 to 12. Supraorbital ridge present.

This genus, which is world-wide and contains a great number of species, is well represented in Australia. It contains the species which do the principal damage to food-products, though none of the native species can vie with the imported black rat and brown rat in this respect. These foreign species are now well established in our midst, the latter in the towns, while the former not only lives in dwellings, but has extended its operations into the gardens and fields, and is becoming widely spread in Eastern Australia. It has, unfortunately, been introduced into Lord Howe Island and other islands of the Pacific, where, finding itself unchecked, it is taking charge and doing great damage to natural products and bird-life. It is very versatile, and will probably oust many of our native forms in country suited to its requirements (see Fig. 17).

The allied rat is one of our best-known forms. This has a wide range from Eastern to South-western Australia. It lives in forest country, both near water and in the hills, even being found on Mount Kosciusko. The typical holes of this animal may be found in banks, under logs, or at the base of a rock. Its footprints may often be noted in the soft ground along the banks of creeks and rivers.

The long-haired rat is an inhabitant of the drier regions of the north and central districts. This species, as previously mentioned, develops the swarming habit, and is at times met with in immense numbers. It appears to be omnivorous.

The swamp-rat is found in swampy country all over Southern Australia. It is a chubby-faced, long-haired species, adapted for living in damp situations. Its presence is marked by well-worn runways through the undergrowth, which often end in holes in banks or under the roots of trees. This species becomes numerous at times, a migration on a small scale being noted in 1914 in the National Park near Sydney.

Swamp rats are nocturnal, very secluded in habits, and rarely leave the cover of reeds and grasses, through which their paths can be seen going in all directions. They often make their stronghold under a mound of *débris*, generally protected by the roots of melaleuca-trees. The nest is well made of shredded bark and leaves, and is placed in the centre of the mound. Three or four young are born, in September; these have hair on them at birth.

We have observed the eastern swamp-rat (*R. lutreola*) at the head of the Styx River, Northern New South Wales, and on Mount Kosciusko, at an elevation of over 5000 feet above sea-level. Here these rats preferred the marshy lands bordering rivers and creeks, especially where entanglements of reeds, long grass, shrubs, and fallen trees gave them ample cover, through which their runways could easily be detected. Tea-tree clumps seemed to be their central stronghold. These rodents seemed to be essentially herbivorous. They did not touch crayfish caught in spring traps in their tracks nor meat baits.

The breeding-burrow was rather an elaborate affair, placed under a heap of *débris* rising some 15 inches from the ground-level, and with a circumference of about 15 feet. The earth and litter were kept in position by a reinforcement of sticks, the whole being just above flood-water level. There were several entrances, each about 3 inches in diameter; some began several feet away, and would wind about, finally connecting with the central chamber. The nesting cavity measured 12 by 9 by 10 inches, and was placed 18 inches below the surface of the mound.

ALLIED RAT

Rattus assimilis, Gould. North-east Queensland to South-west Australia. Gould, *Mamm. Aust.*, iii, Pl. 15; *Rec. Aust. Mus.*, xiii, 3, 1920, p. 119.

Fur long, soft, extremely thick on back; slate-coloured fur tipped with light brown; bases of longer hairs greenish grey to length of fur, remainder either wholly black or tipped with light brown, producing pencilled effect. They are brightly iridescent in sunlight; sides lighter, merging into greyish-buff colour on under surface, which is produced by lighter slate colour of basal fur with its dull white tips. Feet covered with fine silvery-white hairs. Ears laid forward reach little beyond posterior margin of eye. Pinna thin, covered sparsely but evenly with light brown hairs externally, and with silvery to light brown hairs internally. Tail thinly covered with dark brown hairs, with lighter tips, which are generally longer than scales. Head and body, 180 mm.; tail, 160 mm.; hind-foot, 37 mm.

DUSKY-FOOTED SWAMP-RAT

Rattus fuscipes, Waterhouse. South-western Australia. Gould, *Mamm. Aust.*, iii, Pl. 2.

Form stout, robust. Hair thick, soft. General colour above blackish brown with admixture of grey; below greyish white; feet brown; tail black, sparingly covered with short bristly hairs. Head and body, 112–177 mm.; tail, 85–124 mm.; hind-foot, 26–34 mm. (See Fig. 18.)

EASTERN SWAMP-RAT

Rattus lutreola, Gray. South-eastern Australia, from New South Wales to Tasmania. *Rec. Aust. Mus.*, iii, 7, 1900, p. 190 (*Mus fuscipes*, Waite).

Form robust. Fur long, very thick, soft. General colour above yellowish brown to blackish brown; basal portion of fur deep grey, almost black, with tips reddish; many long black hairs show through; muzzle and face grey; whiskers dark brown or black; sides of body lighter; basal portion of hair on lower surface grey, broadly tipped with pale yellow. Ears small, almost naked without, sparingly clothed with short yellowish-brown hairs within; laid forward they fail to reach eye by their own length. Hairs on tail stiff and black, longer than 2 scales (12 scales to cm.). Mammæ, 10. Head and body, 176 mm.; tail, 119 mm.; hind-foot, 29·3 mm.; ear, 21 mm.

GREY'S RAT

Rattus greyi, Gray. Southern, Central, and North-eastern Australia. Gould, *Mamm. Aust.*, iii, Pl. 19.

General colour above subdued brown; individual hairs tipped with warm brown, with the dark greyish under fur showing through; sides and under surface greyish white to yellowish white, with hair darker at base. Ears small, almost naked within; laid forward they do not reach eye by diameter. Feet and toes white. Tail scantily clothed with stiff hairs, dark above, paler below; scales 12 to cm. Head and body, 152–186 mm.; tail, 131 mm.; hind-foot, 26 mm.; ear, 16 mm.

PEARSON'S ISLAND RAT

Rattus murrayi, Thomas. Pearson's Island. *Ann. Mag. Nat. Hist.*, (9) xi, 1923, p. 601.

Nearly allied to *R. greyi*. Fur soft and fine. General colour pale greyish, washed with buffy brown, the grey showing through the brown more than in *greyi*, the general tone being consequently paler; under surface drabby grey, the hairs broadly slaty at the base, with tips drabby whitish, the line of demarcation strongly marked; hands and feet white, with a certain darkening of the metapodials and digits which is not present in *greyi*. Head and body, 134 mm.; tail, 116 mm.; hind-foot, 28 mm.; ear, 19 mm.

BLACKISH-BROWN RAT

Rattus sordidus, Gould. New South Wales (Darling Downs). Gould, *Mamm. Aust.*, iii, Pl. 17.

Form stout. General colour above grizzled black and brown, former prevailing on dorsal aspect; below greyish buff; forefeet greyish brown; hind-feet greyish silver. Tail thinly clothed with extremely fine black hairs. Head and body, 170 mm.; tail, 125 mm.

WHITE-FOOTED RAT

Rattus manicatus, Gould. Northern Territory. Gould, *Mamm. Aust.*, iii, Pl. 16.

General colour above black, gradually shading into deep grey on under surface; fore-parts of lips and nose, stripe down centre of throat and chest, and all feet white; whiskers deep black. Tail naked. Head and body, 175 mm.; tail, 125 mm.

TAWNY RAT

Rattus vellerosus, Gray. Plains between the Mary and Glenelg Rivers, South Australia. Gould, *Mamm. Aust.*, iii, Pl. 12.

Form stout. Fur very long, close, rather soft. General colour above reddish brown, with interspersed whitish hairs; below paler; feet and tail brown, latter with few short, bristly hairs. Head and body, 190 mm.; tail, 115 mm.

LONG-HAIRED RAT

Rattus villosissimus villosissimus, Waite (*Rattus longipilis*, Gould). Central Australia, Northern Territory. Gould, *Mamm. Aust.*, iii, Pl. 13; *Proc. Roy. Soc. Vic.*, x, 1898, p. 125, Pl. 2.

Fur very long, hairy, somewhat harsh to touch; greyish brown at base, tawny buff at tip, thickly interspersed, especially along back, with very long, fine black hairs; under surface buffy grey; feet flesh colour, sparingly clothed with silvery hairs; tail thinly beset with fine, stiff black hairs. Head and body, 153–163 mm.; tail, 144–147 mm.; hind-foot, 30–34 mm.; ear, 20 mm.

Rattus villosissimus profusus, Thomas. Liverpool Plains, New South Wales. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 620.

Fur very long, thicker and softer than in typical form; ordinary hairs 22 mm. in length, and longer piles 50 mm. General colour browner and more strongly buffy than in northern form; hairs of under surface slaty at base; broadly washed terminally with yellowish white. Measurements same as in *Rattus v. villosissimus*.

COLLETT'S RAT

Rattus colletti, Thomas. South Alligator River, Northern Territory. *Nov. Zool.*, xi, 1904, p. 599.

General colour above heavily grizzled greyish brown; spinous hairs and also longer piles broadly tipped with black; ordinary hairs 12 mm. in length, longer piles about 30 mm., also some flattened spines about 12 mm. in length and ½ mm. in width; ordinary hairs tipped with creamy buff more dominant on sides; under surface pale soiled buffy, slaty bases of hairs showing through. Ears almost naked, brown, extreme edges lighter. Upper surface of hands and feet dull white. Tail with 12 rings to cm. Head and body, 136 mm.; tail, 107 mm.; hind-foot, 29 mm.; ear, 16 mm.[1]

Melville Island Rat

Rattus melvilleus, Thomas. Melville Island. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 427.

Like *R. tunneyi*, but larger. Fur coarse, harsh, liberally mixed with flattened semi-spinous hairs; hairs of back 13 mm. in length. General colour above rather strongly ochreous; indistinct ochreous-buff line edging upper colour, this line particularly noticeable along cheeks and sides of neck; under surface dull buffy whitish, hairs mostly whitish to bases. Ears almost naked, fine hairs white. Tail very thinly haired, brown above, slightly lighter below. Mammæ, normally 10. Head and body, 173 mm.; tail, 135 mm.; hind-foot, 30 mm.; ear, 19 mm.

Mondrain Island Rat

Rattus mondraineus, Thomas. Mondrain Island, off Esperance, South-west Australia. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 428.

Nearly allied to *R. fuscipes*, with which it shares general size, long, loose fur, and brown colour. Externally colour is greyer, buffy sub-terminal rings on hairs (which give brown tone to *fuscipes*) being less developed, so that blue-grey of under fur is more perceptible; under surface lighter, ends of hairs more whitish, throat noticeably more whitish than rest of under surface; hands and feet whitish above, without tinge of brown. Tail as in *fuscipes*, moderately haired above and below. Head and body, 160 mm.; tail, 138 mm.; hind-foot, 30 mm.

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[1] This species lives in holes in open clay flats.

TUNNEY'S RAT

Rattus tunneyi, Thomas. Northern Territory (Arnhem Land). *Nov. Zool.*, xi, 1904, p. 223.

Form stout, strong. Fur thin, not spinous; ordinary hairs of back from 9–10 mm. in length, with certain number of longer piles double that length. General colour above uniform sandy buff; rather darker along dorsal area, clearer along sides; under surface white or creamy white, hairs white to bases; ears pale brown; upper surface of hands and feet white. Tail with fairly well developed rings of scales 10 to cm., dark brown above, lighter below. Head and body, 150 mm.; tail, 105 mm.; hind-foot, 30 mm.; ear, 18 mm.

VELVET-FURRED RAT

Rattus velutinus, Thomas. Tasmania. *Ann. Mag. Nat. Hist.*, (5) ix, 1882, p. 415.

Fur exceedingly long, soft, velvety. General colour above peculiar yellowish-olivaceous grey. Hairs about 27 mm. in length, dark slaty grey for nine-tenths of length, with extreme tip yellow; many longer black hairs intermixed; under parts dirty white, hairs with slaty bases and white tips; tail uniform dark brown. Head and body, 143 mm.; tail, 93 mm.; hind-foot, 30 mm.; ear, 16 mm.

QUEENSLAND COARSE-HAIRED RAT

Rattus culmorum, Thomas and Dollman. Central and North-west Queensland. *Proc. Zool. Soc.*, 1908, p. 790.

Fur coarse, sparse, more or less intermixed with flattened spines. General colour above fulvous, varying considerably according to degree of spinousness; sides more buffy; under surface whitish, often tinged with yellow; hairs pale slaty basally on belly, whitish throughout on throat, and sometimes on inguinal region. Ears rather short, practically naked. Upper surface of hands and feet white. Tail with rings at base averaging 10 to cm., thinly haired, dull brownish, a little lighter below. Mammæ, 10. Head and body, 150–160 mm.; tail, 135–140 mm.; hind-foot, 28–29 mm.; ear, 17–19 mm. Specimens from South Australia greyer in colour, with longer and softer hairs; ordinary hair, 20 mm.; longer piles, 30 mm. in length.

VARIEGATED TAILED RAT

Rattus leucopus, Gray. Cape York, Queensland. *Proc. Zool. Soc.*, 1867, p. 598, and 1879, p. 646 (*Mus terræ-reginæ*, Alston).

Fur stiff, harsh, both above and below, most of hairs being developed into flattened, channelled spines; many longer cylindrical hairs on back; whiskers mixed with black and white; general colour above dark reddish brown, longer hairs black; lips, lower part of cheeks, all under surface, and feet yellowish white. Tail almost naked, dusky, irregularly marked with yellowish patches and rings. Ears rather large, rounded, and naked. Feet very large and stout. Head and body, 210 mm.; tail, 180 mm.

PACIFIC ISLANDS RAT

Rattus exulans, Peale. Pacific islands, New Zealand. *U.S. Expl. Exped.*, *Mamm.*, first ed., 1848, p. 47; *Mem. Aust. Mus.*, iii, 1897, p. 165.

Fur fine, scanty, medium length. Colour warm brown, reddish on nape and back; basal half of hair delicate grey, tips yellowish or brown; on back fur mixed with longer and comparatively thick hairs of bristly texture, white or very pale yellow throughout length, extreme tip only being dark brown; muzzle and face warm brown; hairs on sides of body tipped with pale yellow, with no longer or darker hairs intermixed; whole of under surface, including inside of limbs, white, hair pale grey at base. Ears rounded and of considerable breadth; laid forward they do not reach eye. Hind-foot white. Tail normal, hairs longer than scales, but not so long as two scales, except toward the tip; scales, 9½ to the cm. Head and body, 125 mm.; tail, 148 mm.; hind-foot, 28 mm.; ear, 17·5 mm.

KAPA KAPA RAT

Rattus gestri, Thomas. Kapa Kapa, Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 611.

Fur thin, harsh, straight, intermixed with flattened spines, which are not, however, very stiff. General colour above grizzled buff, heavily lined with black; clearer buff on sides; under surface dull buff, hairs slaty basally and yellowish buff terminally. Ears laid forward barely reach posterior canthus of eye, evenly rounded, practically naked. Upper surface of hands and feet dull whitish. Soles of feet with five, sometimes six, pads. Tail finely haired, uniformly blackish. Head and body, 158 mm.; tail, 114 mm.; hind-foot, 28 mm.; ear, 18 mm.

BROWN'S ISLAND RAT

Rattus browni, Alston. Duke of York Island and Manus Island, Admiralty group. *Proc. Zool. Soc.*, 1877, pp. 323, 743.

Fur above and below stiff, harsh, most of hairs being developed into flattened and channelled spines; few longer cylindrical hairs on back. General colour above grey; mixed with reddish, each bristle being light grey at base and either black or light rufous at tip; longer hairs black throughout; under parts dull whitish; feet white, each with dark stripe on upper surface; ears and tail dusky. Tail with about 150 rings of scales, mixed with short stiff hairs. Hind-feet large and broad. Head and body, 167–180 mm.; tail, 115–124 mm.; hind-foot, 25 mm.

NEW GUINEA COARSE-HAIRED RAT

Rattus mordax, Thomas. Papua and Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (7) xiv, 1904, p. 398.

Fur coarse, harsh, spiny, but with many longer bristles intermixed. General colour above coarsely grizzled bistre brown, more tawny on rump; under surface clay colour. Ears short, uniform dull brown. Upper surface of hands and feet brown. Tail coarsely scaled, 9 or 10 to cm., dark brown throughout; its numerous hairs rather over one scale in length. Mammæ, 8. Head and body, 190 mm.; tail, 136 mm.; hind-foot, 32 mm. This species is the Papuan representative of *R. prætor*, from which it differs by its thick incisors and differently shaped palatal foramina.

Rattus prætor, Thomas. Solomon Islands and New Britain. *Ann. Mag. Nat. Hist.*, (6) i, 1888, p. 158.

Distinguished from *R. leucopus* by proportionately shorter hind-foot, shorter tail, and two pairs of pectoral mammæ, making total mammæ 6. Head and body, 188 mm.; tail, 184 mm.; hind-foot, 35 mm.; ear, 15·5 mm.

FLY RIVER RAT

Rattus ringens, Peters and Doria. Fly River, Papua. *Ann. Mus. Civ. Genova*, xvi, 1881, p. 700.

Fur stiff, with channelled bristles. General colour above variegated black and rufous; ochreous yellow below. Ears naked; laid forward they just reach eye. Tail yellowish mottled, covered with very short stiff black hairs. Feet yellowish. Mammæ, 6. Head and body, 190 mm.; tail, 160 mm.; hind-foot, 38 mm.; ear, 22 mm. Papuan representative of *R. leucopus.*

Genus Cyromys, Thomas

Tail naked and very scaly. Hair rather woolly.

Cyromys imperator, Thomas. Solomon Islands (Guadalcanar). *Ann. Mag. Nat. Hist.*, (6) i, 1888, p. 157.

Fur rather woolly; uniformly dark grizzled ashy grey above; whitish below. Ears short and rounded; laid forward they do not nearly reach eye. Mammæ, 4. Soles of feet broad and naked; pads large and smooth. Tail naked and scaly. Head and body, 350 mm.; tail, 258 mm.; hind-foot, 66 mm.; ear, 19 mm.

Cyromys rex, Thomas. Solomon Islands (Guadalcanar). *Ann. Mag. Nat. Hist.*, (6) i, 1888, p. 157.

Closely allied to *C. imperator*, but smaller and with longer and extraordinarily roughened, rasp-like tail. Head and body, 290 mm.; tail, 296 mm.; hind-foot, 55 mm.; ear, 18 mm.

Genus Stenomys, Thomas

Metatarsus lengthened. Feet slender.

Stenomys verecundus, Thomas. Aroa River, Owen Stanley Range, Papua. *Nov. Zool.*, xi, 1904, p. 598.

Fur soft, straight; hairs of back 15 mm. in length, with small number of longer piles about 20 mm. long on hinder back. General colour above sepia brown, faintly ticked with buff; under surface slaty buff, bases of hairs slate, with buff tips; head darker than back. Ears short; laid forward they barely reach middle of eye; practically naked and slaty grey. Arms and legs like back, but little lighter on inner side; metacarpus brown, digits white. Hind-feet unusually long and slender; soles smooth; last pad elongate; fifth toe nearly reaching to middle of first phalanx; metatarsus brown, digits lighter. Tail evenly ringed, scales 10 to cm., finely haired, hairs about 2 scales in length, brown above and below. Head and body, 170 mm.; tail, 168 mm.; hind-foot, 34 mm.; ear, 18 mm.

Stenomys niobe, Thomas. Papua. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 327.

Allied to *S. verecundus*, but smaller. Fur very fine, soft, without any admixture of flattened spines; hairs of back about 11–12 mm. in length. General colour passing imperceptibly into broccoli brown of under surface, hairs of which are slaty, with dull buff points; muzzle dark greyish brown; ears dark brown; fore-limbs dark; digits white. Tail, 15 scales to cm., almost naked, dark brown. Head and body, 126 mm.; tail, 134 mm.; hind-foot, 27 mm.; ear, 16 mm.

Stenomys klossi, Thomas. Charles Louis Mountains, Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 207.

Externally similar to *S. niobe*, but with more inflated brain-case and long narrow muzzle. Head and body, 123 mm.; tail, 130 mm.; hind-foot, 27 mm.; ear, 18 mm.

Genus Anisomys, Thomas

Fur coarse. Pollex with broad nail. Mammæ, 6. (The generic differences are in the skull, which is comparatively long, stout, and heavy.)

Anisomys imitator, Thomas. Aroa River, Papua. *Proc. Zool. Soc.*, ii, 1903, p. 200.

Size and other characteristics remarkably like *U. validus*. Fur coarse, short; hairs of back about 10–12 mm. in length, with no longer piles. General colour above coarsely mixed with blackish fawn; under surface dull buffy white, hairs slightly darker at base; head rather more greyish, heavily lined with black; eyes surrounded by indistinct black rings; fine hairs of ears blackish; arms and legs grizzled grey, under sides lighter; hands and feet brown, becoming whitish at ends of digits. Palms naked, with large smooth pads. Fifth hind-toe nearly reaching to end of first phalanx of fourth. Tail very thinly haired, hairs becoming rather longer toward tip; dark brown for basal fourth, yellowish white for remainder. Head and body, 300 mm.; tail, 320 mm.; hind-foot, 60 mm.; ear, 24 mm.

Genus Mallomys, Thomas

Allied to *Crateromys* and *Lenomys*. Fur long and thick. Ears short. Tail long, coarsely scaly.

Rats belonging to this genus are the largest of the Muridæ, and are stated to be arboreal.

Mallomys rothschildi, Thomas. Papua and Dutch New Guinea. *Nov. Zool.*, v, 1898, p. 1.

Fur very long, thick; woolly for from 30 to 35 mm. on back; few longer hairs twice this length. General colour blackish all over, with silvery suffusion; woolly hairs pale greyish, with silvery or blackish tips; long hairs black, with whitish bases; under surface, like under fur of back, greyish white, with very few black hairs intermixed; whiskers blackish. Ears short, hardly projecting beyond fur, thickly covered with brown hair. Hands and feet black above. Claws brown mesially. Tail brown basally, light terminally; scales very large, not hidden by few short hairs. Head and body, 400 mm.; tail, 380 mm.; hind-foot, 65 mm.; ear, 22 mm.

Mallomys hercules, Thomas. Rawlinson Mountains, Papua. *Nov. Zool.*, xix, 1912, p. 92.

Fur very long; ordinary hairs 35 mm. in length, with longer bristles up to 70 mm. General colour above slaty grey; projecting ends of longer bristles whitish; ordinary fur slaty for most of length, then browner, with tip blackish, sometimes with glossy sub-terminal band; under surface creamy buff, nearly white on throat, inner side of forearms, and inguinal region; chin brown; head uniformly brownish; area round eyes little darker. Ears short, naked, brown. Hands and feet brown above. Basal four inches of tail thickly furred, remainder partially naked; scales 7 to cm., transversely oval, posterior edges turning upward, with two or three minute hairs, about scale in length, growing from each of them; proximal part of tail black, lighter terminally. Head and body, 470 mm.; tail, 400 mm.; hind-foot, 68 mm.; ear, 26 mm.

PREHENSILE-TAILED RATS

Genus Hyomys, Thomas

Fur coarse, harsh. Tail very coarsely scaled, practically naked. Mammæ, 4.

Hyomys meeki, Thomas. Aroa River, Papua. *Proc. Zool. Soc.*, ii, 1903, p. 198.

Fur harsh; general body hairs 25 mm. in length, with longer bristles 60–70 mm. in length. General colour above dark slaty grey; hairs grey proximally, with black or brownish ends, longer bristles dark with whitish ends; under surface greyish, bases of hairs grey, ends buff. Ears short, rounded, naked, with small tufts of whitish hairs above anterior base. Limbs brown. Upper surface of hands and feet nearly naked; palms and soles naked; pads broad and fleshy. Tail practically naked, with two or three minute hairs projecting from below each scale; scales 5 to cm.; proximal third of tail black, terminal part yellow. Head and body, 390 mm.; tail, 345 mm.; hind-foot, 63 mm.; ear, 23 mm.

Prehensile-tailed Rats

Genus Pogonomys, Milne-Edwards

Exactly like *Mus*, but with terminal portion of tail above without scales, quite naked, transversely wrinkled, and prehensile; scales of rest of tail more or less pentagonal or lozenge-shaped, and set in diagonal slanting series.

Pogonomys vates, Thomas. Papua. *Ann. Mag. Nat. Hist.*, (8) ii, 1908, p. 495.

Allied to *P. lamia*, but colour redder and teeth smaller. Fur soft, woolly, 8 mm. on back. General colour above greyish, ochreous buff, or rufous, darker on back, clearer and more rufous on sides; under surface pure white; muzzle light buff. Ears laid forward reach centre of eye; narrow, oval, more or less pointed, whereas in *P. lamia* they are shorter and with truncate ends. Tail long, coarsely and roughly scaled with fair number of minute hairs. Head and body, 120 mm.; tail, 183 mm.; hind-foot, 25 mm.; ear, 16 mm.

Pogonomys lamia, Thomas. Ighibirei, Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 613.

Fur close, soft, woolly. General colour above dull fawn, grizzled with silver; centre of face decidedly lighter; blackish rim round eyes; under surface pure white or yellowish white; hands and feet dark, metapodials not darker. Tail coarsely scaled and lightly haired, pale brown; smooth prehensile portion of upper side of tip markedly distinct from scaly and hairy remainder. Head and body, 111–118 mm.; tail, 158–161 mm.; hind-foot, 24–25 mm.; ear, 17–17·5 mm.

Pogonomys forbesi, Thomas. Sogere, Papua. *Proc. Zool. Soc.*, 1888, p. 239.

Very similar to *M. cervinipes* in size and appearance. General colour above dull uniform rufous grey; under side buff; ring round eyes nearly black; between eyes and ears is prominent white spot. Whiskers very long, shining black; also single bristle above each eye. Ears laid forward reach beyond middle of eye; narrow, not pointed, their anterior edge straight, their tips and posterior margins evenly convex, quite naked inside and terminally outside. Palms with five broad smooth pads. Tail scaly, with minute hairs between scales, its terminal inch quite naked, without scales above, tip with natural curl upward. Head and body, 155 mm.; tail, 222 mm.; hind-foot, 30 mm.; ear above crown, 17 mm.

Pogonomys mollipilosus, Peters and Doria. Katau, Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 613.

Hair soft. General colour above dark brown; hair slaty below, dark brown above; under surface yellowish white. Upper portion of ear, whiskers, and tail blackish. Head and body, 100 mm.; tail, 165 mm.; hind-foot, 26 mm.

Pogonomys dryas, Thomas. Papua. *Nov. Zool.*, xi, 1904, p. 600.

Closely allied to *P. mollipilosus*, but with ears much larger. General colour above dull buffy brown; head and sides lighter and more buffy; under surface pure, sharply defined white. Ears laid forward reach centre of eye, their front edge nearly straight, point broadly rounded, practically naked, pale greyish. Tail brown, except prehensile portion, which is flesh colour. Head and body, 114 mm.; tail, 184 mm.; hind-foot, 23·5 mm.; ear from notch, 15 mm.

Pogonomys loriæ, Thomas. Haveri, Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 613.

General colour dull slaty grey, with tinge of buff; face little lighter; tip of muzzle buff; black rings round eyes; whiskers long, stiff, black. Ears small, narrow; laid forward only just reaching posterior canthus of eye; naked, with light spot behind base of hinder margin. Under surface from chin to anus and upper lips pure, sharply defined white. Metacarpals furred, but fingers naked. Feet with brownish patch extending partly along metatarsals; rest of metatarsals white; digits naked; soles naked, with six large smooth pads; fifth toe reaching without claw to middle of second phalanx of fourth. Tail finely scaled, with non-overlapping hexagonal scales about 10 or 11 to cm., basal half inch furred, remainder practically naked, tip as usual. Head and body, 148 mm.; tail, 214 mm.; hind-foot, 26 mm.; ear, 15 mm.

Pogonomys lepidus, Thomas. Haveri, Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 614.

Fur soft, close. General colour above deep rufous, darker along back, richer and brighter on flanks. Eyes not prominently black-ringed. Ears small, narrow, naked. Upper lips, lower half of cheeks, and under side pure white. Hands and feet white. Tail slender, practically naked, scales 10–12 cm., pale brown, tip as usual. Head and body, 119 mm.; tail, 159–169 mm.; hind-foot, 21 mm.; ear, 14 mm.

Pogonomys sexplicatus, Jentink. Dutch New Guinea (Sentaki Lake). *Nova Guinea*, v, 1907, p. 366.

Hair very soft. General colour above blackish; breast and belly pure white. Whiskers numerous, long. Ears rounded. Tail ringed, scales not overlapping, each scale with single very short hair; toward terminal side of under part clad with parallel plates. Head and body, 150 mm.; tail, 235 mm.; hind-foot, 25 mm.; ear, 13 mm.

Pogonomys pulcher, Thomas. Dutch New Guinea. *Nov. Zool.*, ii, 1895, p. 164.

Fur long, soft, 15–16 mm. in length on back. General colour above soft rufous fawn, reddening posteriorly into deep ferruginous; ill-defined blackish line running backward to surround the eye; no lighter spot behind eye; under surface bright reddish; hairs whiter toward base. Tail clothed with woolly, rufous body fur for about an inch, remainder brown, practically naked. Head and body, 153 mm.; tail, 225 mm.; hind-foot, 33·7 mm; ear, 12 mm.

Australian Mice

Genus Pseudomys, Gray

This genus contains the true mice of Australia, each of which, it may be noted, is different from the imported European mouse.

Our native mice are numerous throughout the continent, but live chiefly in the drier areas west of the Dividing Range. Only one genus has been found in Tasmania. They are often very numerous in the dry, waterless country of Central Australia.

As a rule they make shallow burrows at the base of a bush or under a stone. Possibly when their habits have been thoroughly investigated it will be found that each form has a characteristic nesting-hole, but so far we have very little definite knowledge in this respect.

Hermannsburg's mouse is one of the commonest forms in the central districts. We have noted many burrows on the Nullarbor Plain, South Australia, and found that all the excavations were made in a similar way. The mice were found on the limestone plain, well away from the timber line. They selected a little elevation, often at the base of a bush, in which to make their home. There was only one entrance, outside of which was a fairly large heap of earth. The main burrow was 11 feet in length, made almost in a circle, from 10 to 15 inches below the surface; the nest, made of dry grass, was placed in a specially constructed chamber at the terminus, and with no short cut to it. There were five blind leads going off from the burrow, each about 18 inches in length, giving a total of 8 feet. The whole excavation, therefore, was about 19 feet—a tremendous work for so small an animal. Spencer found this species at Alice Springs; its habits there are somewhat different, probably owing to working in different soil. He states that the mice make large burrows in hard, stony ridges, piling up the excavated stones on the surface; the entrance is about 15 or 20 feet away from this pile, and is a small hole surrounded by a ring of stones.

As far as we have noted, Australian mice are entirely grass- and seed-eaters. There is no record of their ever reaching plague proportions, the trouble in this respect being caused by the imported European mouse.

The enemies of mice are owls, hawks, and snakes, all of which—even the snakes—are most useful in keeping the rodents in check. From the castings of a masked owl, found in a blowhole at Ooldea, three species of rodents were taken; these formed 75 per cent. of the bird's food. The smaller dasyures, phascogales, and *Sminthopsis* also take toll.

All our mice belong to the genus *Pseudomys*, which has been subdivided into four sub-genera.

Sub-genus Pseudomys, Gray

Size variable, mostly much smaller than *Rattus*. Pectoral mammæ not known to be present in any species, the formula being 0–2=4. The genus is founded on skull characters, the principal of which is the absence of supraorbital ridges.

FAWN MOUSE

Pseudomys auritus, Thomas. Lake Albert, South Australia. *Ann. Mag. Nat. Hist.*, (8) vi, 1910, p. 607; Gould, *Mamm. Aust.*, iii, Pl. 7 (*Hyomys murinus*).

Fur long, thick, soft; woolly hairs of back 14 mm. and longer hairs 18·5 mm. in length. General colour above fawn grey, heavily darkened on back by blackened tips of longer hairs; under surface dull buff; hairs slate-coloured, with pinkish-buff tips; sparse hairs of metentote also greyish white; hands and feet silvery white. Tail well haired, brown above, white below. Head and body, 130 mm.; tail, 125 mm.; hind-foot, 32 mm.; ear, 26 mm.

HIGGINS' MOUSE

Pseudomys higginsi, Trouessart (*Mus leucopus*, Higgins and Pettard). Tasmania. *Mem. Qld. Mus.*, v, 1916, p. 31.

Fur long, soft, dark brown, tipped with pale fulvous brown; under fur slaty blue, darker on back; slightly paler on sides, and passing into dull ashy white on under surfaces. Ears long and patulous, internally sparsely and externally thickly covered with short, dark, almost black hairs. Whiskers rather full, black and white. Upper surface of tail clothed with short dark hairs, intermixed with paler hairs; under surface white, hairs concealing scales. Head and body, 145–160 mm.; tail, 175 mm.; hind-foot, 37 mm.; ear, 27 mm.; muzzle to ear, 40 mm.

SHORTRIDGE'S MOUSE

Pseudomys shortridgei, Thomas. Bernier Island, West Australia. *Proc. Zool. Soc.*, ii, 1906, p. 765.

Fur long, soft, loose; ordinary hairs about 17 mm. in length; longer hairs about 22 mm. General colour above pale hair brown, with tinge of buff; individually hairs dark slate colour, with ends clay colour; under surface rather lighter; ears with proectote black; metentote grizzled blackish, edges with well-defined white ring; upper surface of hands and feet dull greyish white. Tail well haired, with scales quite hidden; dark brown above, dull white below. Head and body, **145** mm.; tail, **110** mm.; hind-foot, 27 mm.; ear, 20 mm.

AUSTRALIAN MOUSE

Pseudomys australis, Gray. New South Wales (Liverpool Plains). *Proc. Zool. Soc.*, 1832, p. 39.

Fur soft, thick, close, blackish brown, slightly grizzled at tips; under surface reddish-ash colour; throat and breast greyish ash. Head and body, 134 mm.; tail, 83 mm.; hind-foot, 25 mm.

LONG-HAIRED MOUSE

Pseudomys lineolatus, Gould. Darling Downs, Queensland. *Proc. Zool. Soc.*, 1845, p. 77.

Fur long, very soft. Bases of hairs on upper surface dark slaty grey, followed by dull yellowish, with points black; also numerous long black hairs; sides greyish yellow; under surface greyish white, faintly suffused with yellowish, hair being a deep grey at base; whiskers small and black; eyes encircled with black. Ears well covered with minute hairs; outside black, but greyish white posteriorly and internally. Feet small and white; forefeet greyish at wrist; tarsi indistinctly suffused with yellowish. Tail well covered with small black hairs; under surface brownish black, slightly pencilled with white. Head and body, 140 mm.; tail, 112 mm.

Sub-genus Thetomys, Thomas

SHAGGY-HAIRED MOUSE

Pseudomys (*Thetomys*) *præconis*, Thomas. Sharks Bay, Western Australia. *Ann. Mag. Nat. Hist.*, (8) vi, 1910, p. 608.

Fur rather loose, shaggy, not so fine and soft as in *Ps. albocinereus*, to which this species bears superficial resemblance; back hairs 14 mm., longer bristles 18 mm. in length. General colour above drab grey, median dorsal line browner, side clearer grey; under surface dull whitish, bases of hairs slaty, ends creamy. Ears long, dark brown. Hands and feet dull whitish. Tail long and well haired, slightly tufted terminally, brown above, blackening toward tips, whitish on sides and below. Head and body, 113 mm.; tail, 129 mm.; hind-foot, 6 mm.; ear, 21 mm.

Queensland Mouse

Pseudomys (*Thetomys*) *gracilicaudatus*, Gould. Central Queensland (Darling Downs). *Proc. Zool. Soc.*, 1845, p. 77.

Resembles *Ps. lineolatus*, but has smaller ears, which are clothed internally with dusky, instead of white, hairs. Tarsi smaller; feet much smaller. Tail sparingly clothed with hairs, which are more or less white on under side; hairs on upper side of tail dark-coloured.

Little Mouse

Pseudomys (*Thetomys*) *nanus*, Gould. Western and Central Australia. *Proc. Zool. Soc.*, 1857, p. 243.

Fur harsh. General colour above, including head, outer surface of limbs, and tail, chestnut brown, with numerous black hairs intermixed; under surface white, with conspicuous white patch under tail; whiskers black; feet light brown; on forelegs is dark mark, mainly on outside. Ears short, sparsely clothed with short hairs. Scales of tail averaging 15 to cm. Head and body, 76–96 mm.; tail, 82–94·5 mm.; hind-foot, 20·4–·7 mm.; ear, 10·2–11·6 mm.

Barrow Island Mouse

Pseudomys (*Thetomys*) *ferculinus*, Thomas. Barrow Island, off North-western Australia. *Ann. Mag. Nat. Hist.*, (7) x, 1902, p. 491.

General colour above pale greyish brown, head darker. Ears laid forward only just reach anterior canthus of eye.

Upper surface of hands and feet dull greyish white; external metatarsal pad of soles almost or quite obsolete; internal metatarsal pad of oval shape. Tail very finely scaled, 14–15 rings to cm., finely haired, brown above, dull white below. Head and body, 96 mm.; tail, 93 mm.; hind-foot, 23·7 mm.; ear, 12·5 mm.

GOULD'S MOUSE

Pseudomys (*Thetomys*) *gouldi*, Waterhouse. Southern, Eastern, and Central Australia. *Horn Exped. Zool.*, ii, 1896, p. 398.

Fur long, soft. General colour above pale ochreous yellow, interspersed with long black hairs; entire lower surface, feet, and claws white; ears brown; tail brown above, yellowish white below. Ears laid forward do not reach eye. Hairs of tail long, almost concealing scales, which average 20 to cm. Head and body, 110 mm.; tail, 89 mm.; hind-foot, 25·5 mm.

Waite mentioned that specimens from Alice Springs were smaller, and that they may prove to be a new species. Head and body, 83–91 mm.; tail, 60–77 mm.; hind-foot, 16–17·8 mm.; ear, 10·5–12 mm.

Sub-genus Leggadina, Thomas

FORREST'S MOUSE

Pseudomys (*Leggadina*) *forresti*, Thomas. Northern Territory. *Proc. Zool. Soc.*, ii, 1906, p. 536.

Hair of medium length; hairs of back 9–10 mm., fairly coarse, but not spinous. General colour above pale drab grey, paling to creamy drab on sides, some specimens more buffy; under surface pure, sharply defined white, with hairs white to bases; ears with proectote pale brown, same as general colour of head, tuft of creamy buff hairs at anterior base; upper surface of hands and feet white. Tail well haired, greyish white, little darker on upper side. Head and body, 104 mm.; tail, 72 mm.; hind-foot, 19 mm.; ear, 15 mm.

WOOD-BROWN MOUSE

Pseudomys (*Leggadina*) *patrius*, Thomas and Dollman. North Queensland. *Proc. Zool. Soc.*, 1908, p. 791.

Above pale wood brown; slightly more buffy on sides; under surface greyish white, bases of hairs slaty; hands and feet white. Tail finely haired, brown above, whitish on sides and below. Head and body, 65–70 mm.; tail, 66–71 mm.; hind-foot, 18 mm.; ear, 12 mm.

FIELD'S MOUSE

Pseudomys (*Leggadina*) *fieldi*, Waite. Alice Springs, Central Australia. *Horn Exped. Zool.*, ii, 1896, p. 403.

Fur of moderate length, remarkably fine, fluffy. General colour above warm sandy brown; head little darker; cheeks and sides brighter; whole under surface pure white, with bases of hairs pale grey. Ears large, almost naked within; laid forward they reach centre of eye. Limbs pale sandy colour. Hands and feet white. Tail thin and very long; few short sandy hairs above, becoming darker distally, white below; hairs on tip black and somewhat longer. Head and body, 103 mm.; tail, 122 mm.; hind-foot, 23·5 mm.; ear, 18·5 mm.

HERMANNSBURG'S MOUSE

Pseudomys (*Leggadina*) *hermannsburgensis*, Waite. Central Australia, reaching as far south as Trans-Australian line. *Horn Exped. Zool.*, ii, 1896, p. 405.

Fur soft, long, interspersed with few longer black hairs. General colour above warm brown, darker on back, becoming lighter on sides, where it merges into yellowish under surface; hairs dark grey at base; colour below eye and ear somewhat paler than body; under parts white, bases of hairs grey. Ears large, grey within, and well clothed with whitish hairs outside; laid forward they reach posterior third or centre of eye. Front of fore- and hind-limbs yellow; feet pale yellow. Tail uniform brownish grey above, sides and below white; hairs short, leaving scales well exposed; these average 18 to cm. Head and body, 69–79 mm.; tail, 80–85 mm.; hind-foot, 17–17·5 mm.; ear, 11–12 mm.

Pseudomys (*Leggadina*) *messorius*, Thomas. Melrose, Spencer Gulf, and near Lake Frome, South Australia. *Ann. Mag. Nat. Hist.*, (9) xv, 1925, p. 670.

Size about as in *hermannsburgensis*. General colour above sandy buff; below whitish, the bases of the hairs slaty, their ends white or yellowish (though the latter colour may be due to spirit discoloration); hands and feet white; tail pale brown above, whitish below, not sharply contrasted, and slightly shorter than the head and body. Head and body, 67 mm.; tail, 53 mm.; hind-foot, 17 mm.; ear, 13 mm.

PIGMY MOUSE

Pseudomys (*Leggadina*) *delicatulus*, Gould. North-western Australia and Northern Territory. Gould, *Mamm. Aust.*, iii, Pl. 23.

Fur soft, short. General colour above pale yellowish brown; sides delicate yellow; lower part of sides of muzzle, entire under surface, and feet white; fur uniform colour on throat and mesial line of abdomen. Head and body, 64 mm.; tail, 56 mm.

Sub-genus Gyomys, Thomas

BLUE-GREY MOUSE

Pseudomys (*Gyomys*) *glaucus*, Thomas. South Queensland. *Ann. Mag. Nat. Hist.*, (8) vi, 1910, p. 609.

Fur soft, fine. General colour pale blue grey; ears greyish; hands and feet silvery white; tail pale brown above, white on sides and below. Head and body, 93 mm.; tail, 111 mm.; hind-foot, 22·5 mm.; ear, 18 mm. Eastern representative of *Ps. albocinereus*.

New Holland Mouse

Pseudomys (*Gyomys*) *novæ-hollandiæ*, Waterhouse. Eastern New South Wales (Upper Hunter River). *Proc. Zool. Soc.*, 1842, p. 146; Gould, *Mamm. Aust.*, iii, Pl. 22.

Fur very long, soft. Upper surface deep grey, tipped with brownish yellow; under parts white, with base of hairs pale grey; tail dusky above, white below. Head and body, 75 mm.; tail, 50 mm.

Ashy-grey Mouse

Pseudomys (*Gyomys*) *albocinereus*, Gould. West Australia. *Proc. Zool. Soc.*, 1845, p. 78; Gould, *Mamm. Aust.*, iii, Pl. 21.

Larger than *M. musculus*, and stout in proportion. Fur very long, soft. General colour above pale ashy grey, hinder back with slight brownish tint, produced by very fine and indistinct pencilling of dusky and pale greyish-white hairs; lower flanks and whole under surface white, having faint greyish hue; head greyish white, pencilled with black; sides of muzzle white. Ears well clothed with greyish-white hairs. Feet white. Tail white-pencilled, with few blackish hairs.

This species was reported by Gould, and confirmed by Shortridge, to frequent sand plains. Their burrows have sand thrown up around them, but they often fill up the entrance when inside, thus making them very difficult to see.

European Mouse

Genus Mus, Linnæus

The imported European mouse may be distinguished from the native mice by having the anterior molar tooth longer than the other two combined; the last molar is minute; the upper incisors have a conspicuous notch cut in the inside, above the apex. Mammæ, 10.

The ubiquitous house mouse, now spread over a great part of the world, has made itself quite at home in Australia.

In towns, farmhouses, and in bush uninhabited by humanity it is very much in evidence. It is more numerous in the drier inland districts, and common in Central Australia. Like the rabbit, the European black rat, and the sparrow, it is able to adapt itself to almost any environment, and will probably supplant many of our local species. In Eastern Australia very serious plagues of this species have occurred in the wheat areas. It will usually be found in shallow, single burrows, or taking shelter under any surface cover available.

COMMON HOUSE MOUSE

Mus musculus, Linnæus. Europe, now introduced into most countries. *Zoologist*, (3) xx, 1896, p. 137.

Fur close, adpressed, grey, more or less suffused with brown or fawn, varying according to time of year, darker in winter, lighter and more fawn in summer; under surface lighter in colour. Ears laid forward reach beyond eye. Head and body, 80–90 mm.; tail, 85–90 mm.; hind-foot, 15·5 mm.; ear, 12·5 mm.

JERBOA-RATS

Genus Conilurus, Ogilby

Hind-limbs more or less elongated. Tail tufted. Fur harsh. The members of this genus are confined to Northern Australia. The black-tailed jerboa-rat is found along the seashore in swamps and on the banks of rivers of the lowlands.

Gilbert notes: "This little animal is only seen on the sea-beach where there are large casuarina-trees, in the dead hollow branches of which it forms its nest, of fine dry grass, to which it retires during the day. In the evening it leaves its retreat and proceeds to the beach, where it can be seen running along the edge of the surf as it rolls up and recedes, apparently feeding on any matter washed up by the waves." Gould further remarks that it is frequently found among the swamps of the seashore. Dr Collett has since reported that it is very numerous all over Arnhem Land, being found in great numbers along the rivers of the lowlands. He confirms the statement that it lives in hollow trees.

WHITE-FOOTED JERBOA-RAT

Conilurus albipes, Lichtenstein. Central and South-central Australia. *Tr. Linn. Soc.*, xviii, 1838, p. 126.

General colour above uniform ashy brown ; breast, belly, and feet white. Fur long, close, and soft, ash-coloured at the base, tipped with light brown. Ears long, erect, oval, rounded at extremities ; nearly naked on both internal and external surfaces. Tail uniform in thickness, covered with longish hairs ; dark chocolate brown above, white beneath, and on sides and tip. Head and body, 255 mm. ; tail, 240 mm. ; hind-foot, 45 mm. ; ear, 15 mm.

BLACK-TAILED JERBOA-RAT

Conilurus penicillatus, Gould. Northern Territory and North Queensland. *Proc. Zool. Soc.*, 1842, p. 12 ; Gould, *Mamm. Aust.*, iii, Pl. 5.

Fur rather spiny. General colour above greyish brown, grizzled buff ; occiput and neck tinged rusty colour ; entire under surface, inner sides of legs, and feet white, with faint yellow tint ; apical half of tail black and moderately tufted. Head and body, 184 mm. ; tail, 195 mm.

SHORT-FOOTED JERBOA-RAT

Conilurus melibius, Thomas. Melville Island. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 431.

Colour and general characters as in *C. penicillatus*, but tail blackening distally to about three-fourths of its length, then becoming abruptly white for remainder, terminal fourth being tufted. Head and body, 154 mm. ; tail, 177 mm. ; hind-foot, 37 mm. ; ear, 23 mm.

ELSEY'S JERBOA-RAT

Conilurus hemileucurus, Gray. Central Queensland, Northern Territory. Gould, *Mamm. Aust.*, iii, Pl. 3.

Fur harsh, wiry. General colour above light sandy brown, with numerous long, fine black hairs; under surface buffy white; feet, forearm, and tarsi lighter; basal portion of tail brown, deepening into black in middle, beyond which it is white with short apical tuft, or it may be wholly black. Head and body, 180 mm.; tail, 165 mm.; hind-foot, 36 mm.

Genus Mesembriomys, Palmer

Size large, form normal. Feet narrow, fairly long. Tail very long, jerboa-like, heavily tufted.

LONG-HAIRED JERBOA-RAT

Mesembriomys hirsutus, Gould. North Queensland, Northern Territory. Gould, *Mamm. Aust.*, iii, Pl. 4.

Fur coarse, shaggy. General colour above yellowish brown, with numerous long, interspersed black hairs; occiput and neck tinged rusty yellow; under parts rusty yellow, tinged brown on neck and chest; feet varied above with black and rusty yellow; hands and feet black, but in most specimens hair which covers claws is whitish; basal three-fourths of tail black, remainder rusty yellow, apical tuft exceeding inch in length. Head and body, 260 mm.; tail, 325 mm.

Collett states that this species is numerous all over Arnhem Land, being common on the plains of the Daly River. It is generally found hidden in holes in trees. There are only two young.

REDDISH-BROWN JERBOA-RAT

Mesembriomys macrurus, Peters. Northern Territory. Peters, *Monatsb. K. Ak. Berlin*, 1876, p. 355.

Fur soft. General colour above reddish brown, intermixed with scattered longer black hairs; under parts white.

Ears large, rounded, and rust coloured. Feet clothed with short white hairs. Proximal fourth of tail brown, clothed with short scattered bristles, rest being covered with gradually lengthening white hairs, which at tip exceed inch in length. Head and body, 210 mm.; tail, 312 mm.

Genus Zyzomys, Thomas

Size small, delicate. Tail slender, thickened, lightly pencilled terminally, not heavily haired.

WHITE-TAILED RAT

Zyzomys argurus argurus, Thomas. South Australia. *Ann. Mag. Nat. Hist.*, (6) iii, 1889, p. 433.

General colour above pale sandy rufous, hairs slaty basally; muzzle and under sides white. Ears rounded; when laid forward reaching just beyond middle of eye. Hands and feet pure white. Tail wholly white, more thickly clothed than is usual with rats; tip slightly pencilled. Head and body, 85 mm.; tail, 103 mm.

Zyzomys argurus indutus, Thomas. North-west Australia (Kimberley district). *Ann. Mag. Nat. Hist.*, (7) iii, 1909, p. 151.

Similar to *Z. a. argurus*, but tail, instead of being white, is sharply bicoloured, dark brown on upper surface, white below, and rather more heavily pencilled. Head and body, 107 mm.; tail, 96 mm.; hind-foot, 20 mm.; ear, 18 mm.

Genus Laomys, Thomas

Size medium. Form comparatively short. Fur crisp, almost spinous. Feet short, broad. Tail thickened basally, tapering, heavily haired throughout.

Mr Oldfield Thomas states that members of this species are remarkable-looking animals, quite unlike ordinary Muridæ. Woodward's *Laomys* was obtained at Parry's Creek, Wyndham, in a rough stony gorge, while another species was obtained by the Horn Expedition in Central Australia. The tail is very brittle. The swelling is caused by a thickening of the skin.

WOODWARD'S THICK-TAILED RAT

Laomys woodwardi, Thomas. Kimberley, Western Australia. *Ann. Mag. Nat. Hist.*, (8) iii, 1909, p. 373.

Fur coarse, crisp, almost spinous. General colour above coarsely lined pale greyish, rather paler than drab grey; individually hairs pale grey basally, becoming drab grey terminally, about half with black tips; under surface white —stiff, bristly hairs, white to base. Ears large, broad, pale grey. Fingers and toes pure white. Tail short, tapering, heavily haired throughout, slate grey from admixture of blackish and white hairs above, dull white below. Head and body, 167 mm.; tail, 114 mm.; hind-foot, 29 mm.; ear, 21 mm.

THICK-TAILED RAT

Laomys pedunculatus, Waite. Central Australia. *Horn Exped. Zool.*, ii, 1896, p. 395.

Fur long, thick, harsh. General colour above yellowish brown; basal three-fourths of hair grey, succeeded by yellow, though some hairs are brown, and many of longer ones tipped with black; hairs on sides of body are not brown-tipped, colour there being yellowish, shading into white below; muzzle and face grey; limbs paler than back, fore- and especially hind-limbs ochreous; toes white, with dark line passing from heel along outer side, advancing upward along median line of foot and disappearing before reaching base of toes; similar line traceable on forefeet. Tail at and for about centimetre from its insertion normally thick, then suddenly swells to twice diameter, gradually diminishing in thickness; hairs long, quite concealing scales, very coarse and stiff near base, becoming finer, longer, and pencilled toward tip; colour yellowish, darkening toward tip, whitish on under side; scales average 12 to cm. Head and body, 133–177 mm.; tail, 138 mm.; hind-foot, 25–28·5 mm.

Genus Leporillus, Thomas

Rather large rats, with long hind-legs. Feet short and broad, with six pads. Ears long. Whiskers extremely long. Hair soft. Molars without postero-internal cusps.

These typically Australian 'rabbit-like' rats have rather a wide range over South and Central Australia, and also on some islands in the Australian Bight.

The best-known species, the house-building rat, has long been known to naturalists, as it was noted by Captain Sturt, the first white man to penetrate the central districts. He described their nests as being "made in the form of a bee-hive, about 4 feet in diameter, and 3 feet high." Another early explorer, Sir Thomas Mitchell, noted that the nests were built round a small tree.

During a visit to the Nullarbor Plain, in 1921, we met with this species in considerable numbers, and observed that in that part of the country their habits are different from those that had been previously described. Their characteristic heaps of sticks are to be seen about ten miles out from Ooldea, and are numerous from thence on, where there is no vegetation to be seen but the blue-bush, salt-bush, and a few herbaceous plants.

The nests are rather flat, irregular structures, containing about a barrowload of sticks and foliage from the surrounding bushes, in the centre of which is a well-lined living-chamber. If the sticks are scarce, or the position of the home exposed, some shrewdness and engineering ability is shown in placing a number of small stones over and through the sticks, thus giving the structure greater weight and stability. The little creatures also quickly learnt to appreciate the value and added security of having a large excavation beneath them, for the nests were invariably placed over a large rabbit-warren, with connecting bolt-holes leading into it; this apparently gave more safety than the central bush idea.

Sir George Grey first noted the peculiar habit of these rats of carrying the young about attached to the nipples. In forwarding examples to England he stated: "The specimen, a female, had three young attached to the teats when caught. The mother had no pouch, but the young attached themselves with the same or even greater tenacity than do the young of the Marsupialia. On pulling the young from the teats, they at once seized hold of my glove with the mouth, and held on so strongly that it was difficult to disengage them."

We are glad to be able to confirm this. A female caught in July 1921 had four young attached to the nipples—little grey creatures about an inch and a half long. They were dragged along on their backs, and it was extraordinary that although the mother ran with great rapidity over rough stony ground the young were not detached. Further, she travelled for three days in a small wire trap packed in a suitcase, without any harm to herself or the family, which was successfully reared in Taronga Park. The young grew rapidly, and were soon on their feet, but still holding on to the nipples and following every movement of the mother.

Members of this species have the habit of whipping the tail quickly and spasmodically against the ground; this is apparently a danger signal, for they only do it when alarmed.

WHITE-TIPPED JERBOA-RAT

Leporillus apicalis, Gould. Central Australia. Gould, *Mamm. Aust.*, iii, Pl. 2; *Rec. Aust. Mus.*, xiv, 1, 1923, p. 32.

General colour above pale brown; hairs at base dark grey; numerous fine black hairs; under parts white, with hairs white at base; face and sides of neck bluish grey; flanks mixed grey and buffy white; forefeet white, with dark spot of brown on forearm; hind-feet and tarsi white; tail uniformly blackish or brownish above and dull white below, with small white tuft at tip. Head and body, 169–200 mm.; tail, 210–233 mm.; hind-foot, 40·8 mm.; ear, 31 mm.

This species has been known to inhabit hollow trees, or the nests of another species, *L. conditor*.

JONES' HOUSE-BUILDING JERBOA-RAT

Leporillus jonesi, Thomas. Franklin Island, Nuyts Archipelago, South Australia. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 618.

Fur rather thick, not so woolly as in *L. apicalis*; hairs of back about 17 mm. in length. General colour above dull brown, withers tending more toward buffy; under surface slaty grey, washed with drabby white; sides of belly more strongly drabby; ears dark brown; hands with metatarsals dark brown; digits lighter; feet with ankles, outer sides of metatarsals, and proximal parts of digits brown, inner portion of metatarsals and tips of digits white. Tail well haired, but not tufted, brown above, dull white below. Head and body, 195–206 mm.; tail, 164–178 mm.; hind-foot, 48 mm.; ear, 29 mm.

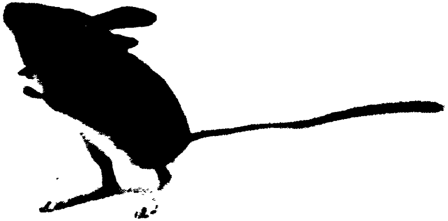
HOUSE-BUILDING JERBOA-RAT

Leporillus conditor, Gould. Central portion of Southern Australia. Gould, *Mamm. Aust.*, iii, Pl. 6; *Rec. Aust. Mus.*, xiv, 1, 1923, p. 24.

Fur soft, fine. General colour above greyish brown; head and flanks greyish fawn; fawn wash round base of ears; ears practically naked, with grey-brown darker border; colour of back extends down outside of limbs and becomes intensified on feet, where it forms dark patch on otherwise whitish hair; under parts and inner sides of limbs creamy white; dark longitudinal mark on centre of chest; when animal sits up naturally this forms continuous band with dark mark on feet. Tail well haired, hairs increasing in length distally and extending beyond tip, brown above, whitish below. Whiskers very long and fine. Head and body, 197 mm.; tail, 178 mm.; hind-foot, 44 mm.; ear, 43 mm. (See Figs. 19 and 20.)

19. House-building Jerboa-rat (*Leporillus conditor*), Mother with Young Attached

20. House-building Jerboa-rats (*Leporillus conditor*)



21. Fawn Kangaroo-mouse (*Notomys cervinus*)

KANGAROO-MICE

Genus Notomys, Lesson

General characters rat-like, but hind-limbs greatly lengthened; hind-foot long and slender, with four or less pads.

This group contains the kangaroo-mice, which are delicate little animals especially adapted for living in the drier regions of the continent. They are the Australian representatives of the large group of long-limbed and large-eared mice that live in similar country in America and Africa. Though belonging to different families, they have become specialized in the same way. We have several closely allied species that are found over the whole continent, with the exception of the east coast and the south-eastern corner, though one form is found at Cape York. Their true home is in the inland plains, where they are often found in numbers in quite waterless country.

They all seem to make the same characteristic cavity-dwelling, which cannot be mistaken for that of any other rodent. The main entrance is a circular hole, which goes down perpendicularly for about four feet; from the bottom of the main shaft are three or more holes coming to the surface, usually under some grass or cover, while another hole going away almost horizontally comes out some distance off; this is blocked up, and is indicated by a big heap of earth, evidently the sweepings from the burrow. Mitchell's kangaroo-mouse appears to prefer the sandhill regions, while the fawn-coloured species keeps to the more open and harder ground. Gould's kangaroo-mouse is confined to the western half of the continent, inhabiting timbered country, usually in the vicinity of water. Shortridge reports that their homes are difficult to find; the holes are small, and generally hidden under tufts of grass.

GOULD'S KANGAROO-MOUSE

Notomys gouldi, Gray. Western Australia. Gould, *Mamm. Aust.*, iii, Pl. 9 (*Hapalotis mitchelli*, Gould—not *Notomys mitchelli* of Ogilby).

Fur very close, fine. All upper surface and outside of limbs pale sandy, interspersed over head and back with fine black hairs, which become more numerous and longer on posterior back, giving that portion darker hue. Ears dark brown, naked, somewhat pointed. Sides of face, all under surface, inner sides of limbs, and feet greyish white; down centre of throat and chest broad patch of pure silky white. Upper surface of tail dark brown, under surface white, hairs becoming much lengthened distally. Whiskers very long, fine, and black. Head and body, 120 mm.; tail, 154 mm.; hind-foot, 36 mm.

LONG-TAILED KANGAROO-MOUSE

Notomys longicaudatus, Gould. Central Australia. Gould, *Mamm. Aust.*, iii, Pl. 8.

Fur close, very soft. General colour above pale sandy, intermixed with numerous fine black hairs, longest posteriorly; under surface white. Ears large, naked, dark brown. Feet and tarsi white. Basal half of tail clothed with short dark brown hairs, apical half with longer black hairs and tipped with white. Head and body, 175 mm.; tail, 225 mm.; hind-foot, 45 mm. Largest of the genus.

STURT'S KANGAROO-MOUSE

Notomys sturti, Thomas. Interior of New South Wales. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 537.

A smaller species than *N. longicaudatus*. Head and body, 132 mm.; tail, 200 mm.; hind-foot, 45 mm.

The following two species, *fuscus* and *cervinus*, have a small but clearly developed neck-pouch, which has led several authors to place them in a separate genus—*Ascopharynx*, Waite (*Tr. Roy. Soc. South Aust.*, xxxix, 1915, p. 735).

BROWN KANGAROO-MOUSE

Notomys fuscus, Wood Jones. Central and South-central Australia. *Rec. South Aust. Mus.*, iii, 1, 1925, p. 3.

External form and measurements as in *N. cervinus*. General colour above rather drab and uniform isabelline light brown; individual hairs smoky at their bases, brown for the greater part of their length, the tips being only slightly darker, the colour gradually merging into the white of the under parts; hairs of the under parts pale smoky at their bases. Ears long, thin, membranous, dusky colour throughout, a few light brown hairs clothing the base without. Feet white; hind-foot with three pads only, the one at the base of the first digit, which is present in *N. cervinus*, being absent. Tail clothed with short brown hairs on the dorsal surface, and well pencilled at the end with a shaft of brown hairs; below the hairs are white, a small portion of the ventral surface of the terminal point being composed of white hairs.

Head and body, 103–110 mm.; tail, 108–135 mm.; hind-feet, 32·5–34 mm.; ear, 25–27 mm.

FAWN KANGAROO-MOUSE

Notomys cervinus, Gould. Central and South Australia. Gould, *Mamm. Aust.*, iii, Pl. 10.

General colour above light fawn, intermixed with numerous fine black hairs; ordinary hair grey at base; under surface white, hairs same colour throughout; hands and feet white. Whiskers very long, base black, tips grey. Head and body, 95–110 mm.; tail, 115–137 mm.; hind-foot, 32–35·8 mm.; ear, 21·8–25·3 mm. (See Fig. 21.)

Notomys alexis, Thomas. Alexandria, Northern Territory. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 316.

General colour sandy brown, paler than in *N. mitchelli*, but darker than in *N. cervinus*; sides paler sandy; under surface well-defined white. Tail well pencilled for terminal third, sandy above for proximal half, then blackish to tip; below white throughout, the two colours well contrasted terminally. Head and body, 109 mm.; tail, 135 mm.; hind-foot, 32 mm.; ear, 21 mm.

Notomys macrotis, Thomas. Moore's River, Western Australia. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 540.

Very similar to *N. gouldi* in colour and general characters, but larger and with coarser fur. It is, however, easily distinguished by its large open palatal foramina. Head and body, 118 mm.; hind-foot, 40·5 mm.; ear, 26 mm.

Notomys aquilo, Thomas. Cape York Peninsula. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 540.

A small, pale, thin-furred species. General colour above pale sandy brown; white below, the hairs white to their bases. Feet thinly haired, flesh-coloured. Tail sandy brown, not conspicuously bicoloured proximally. A well-marked neck-gland present. Head and body, 108 mm.; hind-foot, 35 mm.; ear, 16 mm.

Notomys mitchelli, Ogilby. South-central and South Australia. *Tr. Linn. Soc.*, xviii, 1838, p. 129.

General colour above pale ashy brown, clearer and more greyish ash beneath. Ears large, erect, rounded at the top, apparently naked. Tarsi and paws covered with very short adpressed silvery hairs. Tail with long silky black hairs at tip, forming a brush. Head and body, 120 mm.; tail, 150 mm.; hind-foot, 33 mm.; ear, 20 mm.

Genus Lorentzimys, Jentink

These beautiful little jumping mice are characterized by a very slender elongated tail, large hind-feet, and elongate, pointed ears.

NEW GUINEA KANGAROO-MOUSE

Lorentzimys nouhuysii, Jentink. Noord River, Dutch New Guinea. *Nova Guinea*, ix, 1911, p. 174.

General colour above, middle of head, and upper part of cheeks reddish brown, each hair being slaty for two-thirds of its length, and tipped reddish brown. Hair soft, adpressed, longest not exceeding 6 mm. Head slaty round eyes and from eyes to ears; sides of muzzle white; hair on under parts slaty, tipped with pale reddish brown; fore-feet grizzled, hind-feet brownish; hairs of extremities very short, with exception of white hairs overlapping sharply pointed and arched claws. Tail with rather large scales, imbricated, nearly hidden by brownish hairs elongated toward tip, forming small pencil. Ears pointed. Whiskers numerous and very long. Anterior extremities with four toes, fifth being so small that only flat nail is seen. Head and body, 85 mm.; tail, 103 mm.; hind-foot, 22 mm.; ear, 15 mm.

MOSAIC-TAILED RATS

Genus Uromys, Peters

Scales of tail do not overlap, but are set on edge so as to form mosaic pattern. Size large. Hind-foot, 52 mm. and upward. Length of skull, 60 or more mm. Tail long, commonly with contrasted white tip.

This distinct group, which ranges through the Moluccas and the Solomons to Northern Australia, is easily distinguished by the setting of the scales on the tail. With the exception of *M. banfieldi*, we have very little knowledge of their habits. Some of the genus share with the house-building rat the peculiar habit of carrying the young on the teats. The late C. W. De Vis, in writing of *M. banfieldi*, noted that the corrugated nipples are large compared with the size of the animal, measuring up to 20 mm. in length. From the late E. J. Banfield, of Dunk Island, North Queensland, we learn that the young are born naked, " the tint of a half-ripe tomato of the red variety, and keep to the mother until they are a third of her size; they are then of a pretty silvery-grey colour."

As far as we know, these rats do not burrow, but build nests above the ground. On this point Banfield states: " I find the nests varied in situation. Sometimes they are built of shredded bark, but usually of dry grass, very loosely compacted in the shape of a ball. In the bush they are placed in hollow logs, cavities of dead timber, at the base of the adventitious roots of the pandanus, under ledges of rock, or any secluded place where it is cool and dry. Frequently they invade the house; we have known them make nests on the table of this office, tearing in a single night a quantity of paper far beyond their apparent needs." At Ravenshoe, North Queensland, the late C. M. Hoy found a circular grass nest of this species placed in a mass of vines.

Usually the creatures run fairly quickly, but under the influence of excitement they jump two or three feet in getting over the ground, and they climb with the careless abandon of the opossum.

We have noted *M. cervinipes* at Ebor, in New South Wales. They do not appear to be at all numerous as compared with other species of rodents. Their disposition is very quiet, and they do not attempt to bite when handled.

Uromys scaphax, Thomas. Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 209.

Related to *U. aruensis*, but colour less rufous. Fur harsh. General colour dark grizzled grey, with slight fulvous tinge; dorsal area slightly darker; under surface and inner sides of limbs white; hands and feet pale brown; tail black, with tip yellow. Head and body, 277 mm.; tail, 235 mm.; hind-foot, 52 mm.; ear, 26 mm.

Uromys rothschildi, Thomas. Rawlinson Mountains, Papua. *Nov. Zool.*, xix, 1912, p. 91.

General colour above blackish grey; under surface dull whitish; bases of hairs pale slaty, except on throat and small patch on chest, where they are white to roots; chin dark brown; ear brown, naked, rounded; hands and feet blackish above; tail with basal two inches black and hairy, remainder same colour, but naked. Head and body, 350 mm.; tail, 355 mm.; hind-foot, 68 mm.; ear, 23 mm.

Uromys multiplicatus, Jentink. Dutch New Guinea. *Nova Guinea*, v, 1907, p. 367.

Fur very soft. General colour above mousy; hairs yellowish, tipped with brown on back, also numerous longer glistening black hairs; chin, chest, and belly pure white; hands and feet soot-coloured. Ears broadly rounded off. Toward end of tail scales absent, merely their pattern showing; tip of tail bare, without pattern. Head and body, 185 mm.; tail, 165 mm.; hind-foot, 46 mm.; ear, 17 mm. (immature).

Uromys ductor, Thomas. Aroa River, Dinawa, Owen Stanley Range, Papua. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 213.

Closely allied to *U. validus*, but distinguished by a larger skull. Colour more fulvous; general colour approaching cinnamon, quite uniform; hands whitish; feet pale brown. Head and body, 325 mm.; tail, 280 mm.; hind-foot, 55 mm.; ear, 26 mm.

Uromys validus, Peters and Doria. Katau, Papua. *Ann. Mus. Civ. Genova*, xvi, 1881, p. 703.

Thomas states that this species is "probably not distinct from *U. macropus*."

Uromys prolixus, Thomas. Haveri, Papua. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 213.

Like *U. validus* and *U. ductor*, but with longer feet and long narrow skull. Head and body, 265 mm.; tail, 262 mm.; hind-foot, 61 mm.; ear, 25 mm.

Uromys macropus, Gray. North-east Australia. *Proc. Zool. Soc.*, 1886, p. 221.

Fur moderately soft, but longer hairs rather bristly. General colour above greyish brown, tinged with reddish, some coarse black-tipped hairs intermixed; under surface white. Whiskers very long, stiff, black. Feet white. Tail black on basal part, white or pale yellow on apical half. Head and body, 363 mm.; tail, 360 mm.

Uromys anak, Thomas. North-east New Guinea, not less than 4000 feet. *Ann. Mag. Nat. Hist.*, (7) xx, 1907, p. 72.

General colour above coarsely mixed with grey brown, becoming bistre brown on middle back, ringed, and rufous or burnt umber on rump; some hairs on fore-back ringed black and white; under surface mixed with brown and whitish, most hairs brown, with white tips; muzzle and chin dark brown. Ears short and naked. Arms grizzled brown, inner colour rather lighter; upper surface of hands reddish brown. Hind-legs dark rufous, becoming brown on metatarsals. Toes naked except for brown hairs at root of claws. Tail wholly black, except for short, hairy basal portion, which is deep reddish. Head and body, 310 mm.; tail, 400 mm.; hind-foot, 69 mm.; ear, 24 mm.

Uromys nero, Thomas. Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 208.

Fur rather harsh, thick. General colour above very dark, coarsely grizzled bistre brown; mesial dorsal area blackish; sides of cheeks and shoulders grey; under surface pure white; inner sides of limbs white. Tail practically naked, terminal part yellow all round; basal portion black above and more or less yellow below. Head and body, 297 mm.; tail, 232 mm.; hind-foot, 56 mm.; ear, 30 mm.

Uromys aruensis, Gray. Aru Islands. *Ann. Mag. Nat. Hist.*, (4) xii, 1873, p. 418.

General colour reddish brown; darker on back, which is varied with blackish-brown stiff hairs; upper lips, lower sides of head, throat, chest, under side of body, and inner side of limbs pure white. Ears naked. Tail black, terminal quarter white. Feet covered with short stiff hairs.

Genus Melomys, Thomas

External characters same as *Uromys*. Smaller in size; largest with hind-foot measuring 43 mm. and skull 51 mm.; majority are far smaller. Tail is usually shorter than *Uromys*, and either wholly black or lighter below, but now not known to have an abruptly white tip.

Melomys gracilis, Thomas. South-east Papua. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 328.

Fur long, close, about 11 mm. on back. General colour above cinnamon brown; sides brighter; under surface pure white. Ears short, thinly haired, brown. Hands and feet almost naked, pale brown; digits lighter. Tail dark brown. Head and body, 140 mm.; tail, 175 mm.; hind-foot, 27 mm.; ear, 16 mm.

This species is readily distinguished from its nearest ally, *M. stalkeri*, with which it closely agrees in colour, by its longer tail and markedly narrower interorbital region.

Melomys lutillus, Thomas. Papua. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 216.

General colour above dark clay colour or dull fulvous; under surface paler, hairs slaty at base, buffy terminally; throat, axillary region, and centre of belly with ill-defined whitish patches; larger white patch covering inguinal region; hands and feet whitish; tail brown. Head and body, 112 mm.; tail, 114 mm.; hind-foot, 24 mm.

Melomys murinus, Thomas. Murray Island, Torres Strait. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 216.

General colour strongly fulvous; under surface white, narrowed on belly; hands and feet white. Scales on tail 14 to cm. Head and body, 97 mm.; tail, 109 mm.; hind-foot, 24 mm.; ear, 16 mm.

Melomys muscalis, Thomas. Lower Fly River, Papua. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 217.

Same as *M. murinus*, but with smaller teeth.

Melomys bruijnii, Peters and Doria. Salawatti, Papua. *Ann. Mus. Civ. Genova*, viii, 1876, p. 336, xvi, 1881, p. 704.

General colour above rusty red, with hair lead-coloured at base ; under surface and forepaws white ; hind-feet brownish ; dark line round eyes ; tail black. Head and body, 120–190 mm. ; tail, 150–190 mm. ; hind-foot, 32–37 mm. ; ear, 16–18 mm. Species varies much in size ; it is very like *M. cervinipes*.

Melomys stalkeri, Thomas. Gira River, Papua. *Ann. Mag. Nat. Hist.*, (7) xiv, 1904, p. 202.

Fur soft, fine, about 10 mm. on back ; straight on head and back, more woolly on rump. General colour above uniform cinnamon brown, slightly ticked or lined, sides little paler ; middle line from throat to anus for breadth of about ½ to 1½ inches pure white ; head rather greyer, without specific orbital or other markings ; upper surface of hands and feet dull whitish. Head and body, 135 mm. ; tail, 137 mm. ; hind-foot, 27 mm. ; ear, 16 mm.

Melomys calidior, Thomas. Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (8) vii, 1911, p. 387.

Similar to *stalkeri*, but fur crisper, colour darker, warmer, and more heavily ticked with black. General colour above cinnamon ; sides of belly edged buff ; head grey ; hands whitish, with dark metacarpal mark ; feet dull whitish brown ; tail black. Head and body, 153 mm. ; tail, 156 mm. ; hind-foot, 30 mm. ; ear, 17 mm.

Melomys leucogaster, Jentink. Dutch New Guinea (Noord River). *Res. Ex. Neerl. Nouv. Guin.*, i, 9, 1908, p. 9.

Resembles *M. calidior*, of which it is a local form, but larger. Fur soft, shorter than in *M. lorentzi.* General colour above mouse colour tipped with brown ; hands and feet blackish, especially on the fingers and toes ; tail black ; hairs of all under parts pure white throughout. Ears broadly rounded off. Head and body, 175 mm. ; hind-foot, 35 mm. ; ear, 16 mm.

Melomys porculus, Thomas. Guadalcanar, Solomon Islands. *Ann. Mag. Nat. Hist.*, (7) xiv, 1904, p. 400.

General colour above Prout's brown, umber on rump ; head bistre brown ; sides dark greyish brown, passing into dull cream buff on lower surface ; patch of clear cream buff on chest ; arms and legs brownish grey ; hands and feet dull whitish. Feet very broad and heavy, with large rounded pads. Ears very small, not reaching to eyes when laid forward. Tail short, thin, and naked, except at base, all black. Head and body, 220 mm. ; tail, 130 mm. ; hind-foot, 43 mm. ; ear, 19 mm.

Melomys platyops, Thomas. Aroa River, Papua. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 327.

Fur thick, soft, woolly ; hair on back about 11 mm. in length. General colour above dark clay ; more tawny on crown and rump ; clearer and more buffy on sides ; under surface and inner sides of limbs pure white ; white area somewhat narrowed on belly ; face greyish brown. Ears short, naked, dull brown. Hands and feet almost naked, white or flesh colour. Tail dark brown, with few scattered bristles ; rings of scales 14 to cm. Head and body, 142 mm. ; tail, 154 mm. ; hind-foot, 28 mm. ; ear, 14 mm.

Melomys mollis, Thomas. Dutch New Guinea (Charles Louis Mountains). *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 210.

General characters much as in *M. platyops*, but fur longer, softer, and more woolly. Colour all over duller and more 'saturate,' that of the belly less sharply defined laterally and more suffused with buff; feet dull buff. Head and body, 161 mm.; tail, 140 mm.; hind-foot, 34 mm.; ear, 21 mm.

Melomys moncktoni, Thomas. Papua. *Ann. Mag. Nat. Hist.*, (7) xiv, 1904, p. 399.

Allied to *M. levipes*, but with shorter feet and more hairy tail. Head and body, 160 mm.; tail, 127 mm.; hind-foot, 30·5 mm.; ear, 16 mm.

Melomys banfieldi, De Vis. Dunk Island, Queensland. *Ann. Qld. Mus.*, 7, 1907, p. 8.

Fur short, soft, with few longer piles. General colour above russet brown, lead grey basally, and tipped with rufous; hands and feet on upper sides pale greyish brown as far as digits, which are white; lips brownish white; tail blackish. Head and body, 140 mm.; tail, 152 mm.; hind-foot, 28 mm.; ear, 15 mm.

Melomys levipes, Thomas. Haveri, Papua. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 617.

Resembles *M. bruijnii*, but is easily distinguished by its slender limbs and especially slender feet. General colour brownish rufous; browner anteriorly, more rufous on sides and rump; belly dull creamy white; base of hairs slaty colour; upper sides of hands and feet white. Sole-pads high and prominent. Tail naked and finely scaled, brown above, lighter below. Head and body, 147 mm.; tail, 152 mm.; hind-foot, 38 mm.; ear, 19 mm.

Melomys lorentzi, Jentink. Dutch New Guinea. *Res. Ex. Neerl. Nouv. Guin.*, i, 9, 1908, p. 8.

Closely allied to *M. levipes*. Tail conspicuously bicoloured.

Melomys naso, Thomas. Papua. *Ann. Mag. Nat. Hist.*, (8) vii, 1911, p. 386.

Doubtfully distinct from *M. lorentzi*, but the skull apparently larger.

Melomys cervinipes, Gould. Eastern Australia. Gould, *Mamm. Aust.*, iii, Pl. 14.

Fur short, soft, adpressed, without any longer piles. General colour above sandy brown, below buffy white and grey; feet and tarsi fawn colour; tail purplish flesh colour. Head and body, 150 mm.; tail, 145 mm.; hind-foot, 32 mm. Young are bluish grey above and greyish white below. Specimen from Ebor, New South Wales, at elevation of 4000 feet, had fur soft and dense. General colour above soft brownish grey, sides more fawn, under parts greyish, throat white.

Melomys melicus, Thomas. Melville Island, Northern Territory. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 215.

General colour above varying from broccoli brown to cinnamon; under surface dull greyish; hairs slaty basally, more or less buffy terminally; chin, throat, and axillary regions nearly always white; white patch across groin; hands and feet dull whitish. Tail dark above, about 11 rings to cm. Head and body, 122 mm.; tail, 149 mm.; hind-foot, 29 mm.; ear, 19 mm.

Melomys arcium, Thomas. Rossel Island, D'Entrecasteaux group. *Ann. Mag. Nat. Hist.*, (8) xii, 1913, p. 214.

General colour above dull rufous brown; below white, hairs white to bases; hands and feet white, metapodials brown. Head and body, 138 mm.; tail, 127 mm.; hind-foot, 28 mm.; ear, 18 mm.

Melomys rufescens, Alston. Duke of York Island. *Proc. Zool. Soc.*, 1887, pp. 124, 743.

Fur close, woolly; hairs little developed. Upper parts chestnut, hairs lead colour at base, broadly tipped with bright rufous, longer hairs black; top of head more greyish; under parts white; feet pale brownish; ears and tail dusky. Ears short, rounded, naked. Head and body, 163 mm.; tail, 120 mm.; hind-foot, 27 mm.; ear, 12 mm.

Melomys lanosus, Thomas. Doormanpad-bivak, North New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 263.

A soft-haired species, rather smaller than *M. rattoides*; colour greyish. Head and body, 175 mm.; tail, 143 mm.; hind-foot, 36·5 mm.

Melomys rubex, Thomas. Doormanpad-bivak, North New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 263.

Size small. General colour rufous; under surface washed with pale rufous grey; no hairs white at base. Head and body, 132 mm.; tail, 130 mm.; hind-foot, 29 mm.

Melomys rattoides, Thomas. Mamberano River, North New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 263.

A large species with close glossy fur and a long slender skull. Head and body, 210 mm.; tail, 160 mm.; hind-foot, 41 mm.

Genus Solomys, Thomas

External characters similar to *Uromys*, but with tail wholly black, and tip smooth and shining above.

Solomys sapientis, Thomas. Ysabel Island, Solomon Islands. *Ann. Mag. Nat. Hist.*, (7) ix, 1902, p. 446.

Fur close, fine; woolly hairs about 13 mm., and straight ones 10–12 mm. longer. General colour above uniform cinnamon brown, mixed with blackish tips of longer hairs; sides scarcely paler; belly pinkish buff. Whiskers long, fine, brown. Ears very short, laid forward barely reaching half-way to eye, practically naked, grey. Upper surface of metapodials whitish buff; darker patch on outer halves; digits practically naked; soles broad, smooth, naked; pads broad and low. Tail with basal inch woolly like body, then evenly and abruptly naked, its rings of scales running 8 to 9 to cm.; tip smooth and shining above; colour uniform dull brown or black. Mammæ, 4. Head and body, 250 mm.; tail, 250 mm.; hind-foot, 51 mm.; ear, 17·5 mm.

POUCHED ANIMALS, OR MARSUPIALS

ORDER MARSUPIALIA

MARSUPIALS comprise a wonderfully diversified group of mammals, characterized by having a pouch in which to carry the young, and by many anatomical differences from other animals. They range in size from large kangaroos to diminutive pouched mice.

The various members of the order take many different forms, which are adapted to widely different modes of life. By far the greater number of species are found in Australia and the surrounding islands; two groups, however, extend to America.

The order is divided into two main branches. These are the herbivorous animals, most of which feed on vegetable matter, classified under the sub-order Diprotodontia, and the carnivorous and insectivorous marsupials of the sub-order Polyprotodontia.

SUB-ORDER DIPROTODONTIA

Two incisor teeth in the lower jaw.

This sub-order embraces all the marsupials having two incisor teeth in the lower jaw, and is naturally divisible into three families. The Macropodidæ include the kangaroos, wallabies, and rat-kangaroos, which, excepting the tree-kangaroos, live on the ground. The Phalangeridæ include the opossums or phalangers, the native bear, etc., which are mainly tree-living. The Phascolomyidæ include only the wombats, which are ground-living and burrowing animals.

FAMILY MACROPODIDÆ

Marsupials with two incisor teeth in lower jaw. Hind-limbs much longer than fore; adapted for a jumping or leaping mode of progression. Forefeet with five sub-equal digits; hind-feet with second and third digits very slender, united (syndactylous), fourth very large, with long strong claw, fifth similar, but smaller; first toe entirely absent in all members of the family except *Hypsiprymnodon.* Tail long, hairy. Pouch large, opening forward.

SUB-FAMILY MACROPODINÆ

KANGAROOS AND WALLABIES

Fourth premolar with axis in same general line with tooth row; molars transversely ridged, increasing in size backward, fourth rising to its place very late in life; first upper incisor but little exceeding the others in length. Claws of forefeet of moderate size, sub-equal. Hind-feet without first toe.

Genus Macropus, Shaw

Size very variable, ranging from the largest kangaroos to the smallest wallabies, little larger than rabbits. Ears well developed, turning in any direction, independently of each other. Hind-limbs very large and strong. Central hind-claw long, exceeding terminal pad in length (except in *M. bernardus*). Tail long, thick, tapering, evenly haired in kangaroos, and with longer hairs toward tip in wallabies. Mammæ, 4. Large wallabies are often classed under separate genus *Wallabia,* and small wallabies under *Thylogale.*

The members of this genus include the typical kangaroos and wallabies, the animals most closely associated with Australia. In bodily shape they resemble some of the extremely ancient reptilian forms that inhabited the earth when this order was in the height of development. They can be roughly divided into three groups, consisting of the larger kangaroos, the large wallabies, and the smaller wallabies.

The various species, by adaptive variation, have taken possession of every kind of country, each species having its own special environment with which its bodily shape and colour are in harmony. Thus we have the grey kangaroo living in the open forest to which its brown-grey coat is well suited; the black-faced kangaroo inhabits the denser thickets, in the shade of which its brown fur is almost indistinguishable; on the open plains of the interior, more often than not on red soil, the red kangaroo has its home; while the powerful wallaroo is perfectly at home on the rough hillsides. The wallabies keep close to cover, hiding during the day among the scrub and undergrowth and coming out in the evening to feed at the edge of the thickets.

As it is not very easy for these animals to travel over rough country or through thick undergrowth, the kangaroos sometimes, and the wallabies often, form tracks through the scrub which give access from the thickets to the open ground, or from one feeding-spot to another. These tracks then take the easiest grades, and often run across the slope of a hill. When travelling slowly these animals move over the ground in a manner peculiar to themselves, swinging the legs forward between an arch formed by the arms and the tail. In this manner the average kangaroo will cover about three feet at a stride. When the animal hops the body is inclined forward and balanced on the hind-legs by the tail, which does not touch the ground. At a slow pace the distance covered is from four to six feet, but this rapidly lengthens with the speed, and a large active animal will easily cover twenty-six feet at a stride. Such a jump, however, is not made every time, for the distance varies with the ground, and one hop may be ten feet shorter or longer than the next. A hunted kangaroo has been known to clear a nine-foot fence, but very few will attempt anything over five feet.

A male kangaroo is a clever and determined fighter, and when brought to bay by dogs will put its back against a tree or rock, and be ready for all comers. Woe betide the rash hound that rushes in impetuously to the attack, for the powerful hind-feet, armed with spear-like claws, can be used with deadly effect, and will rip open the flanks of the enemy in a flash.

Kangaroos usually lie up during the day in some sheltered spot. The 'reds' favour the lee-side of a shady tree; the 'greys' prefer a dry, sheltered spot, usually an open glade in winter, in the timber; and the wallaroos like to lie under a ledge or in a cave on the sunny or shady side of a hill, according to the time of the year and the prevailing wind. In the late afternoon they move off to the feeding-grounds, the old males in the lead and the females and young in the rear. When they are hunted this order is usually reversed; then the young, active animals, being the fleetest, will leave the older ones and females carrying young behind. Permanent resting-places can be distinguished by circular holes made in the ground, in which they dust themselves and lie more comfortably. The voice of all members of the genus is a hoarse cough. Many animals have some form of amusement to occupy their spare time. With the larger kangaroos this takes the form of 'boxing.' They do this quite naturally, and seemingly for fun, and it is indulged in only by the males. The performance consists of grappling and cuffing about the head and shoulders, and vigorously kicking the opponent on the body with the hind-limbs. The 'rounds' are fairly regular as regards time—a three minutes' bout, with a rest of about the same time.

There is no set time for the kangaroos to bring forth their young, although in the south the majority of them are born in the winter. In the north and central districts this depends a good deal on the season, and young may be found at any time; this is especially noticeable with those kept in captivity. The young are born in a very immature state. For a long time observers were puzzled as to how such a tiny, naked thing, about an inch in length, could get into the pouch, and when there become firmly attached to the nipple. It was very commonly concluded that it *grew* there. This, however, is not so. When the young kangaroo is born its forelegs and head are disproportionately large and mobile, and it is able to make its way through the hair (assisted sometimes, perhaps, by the mother's lips), to the pouch, and then fasten itself to the nipple. The nipple at this time is pointed and firm, but when it enters the little one's mouth it softens and enlarges, filling the cavity so that it cannot be detached without rupturing the parts. The young stays in this position, closely enfolded by the walls of the pouch, for about four months, by which time it has grown to its normal shape and developed a coat of hair. It is then able to take some interest in outside life ; its head may be seen protruding from the pouch, and perhaps nibbling the grass as the mother moves about. Later the youngster comes out, and, like all young things, scampers about, enjoying its liberty, but ever ready to scramble 'home' again if danger threatens.

The actual progress of the young to the pouch has been witnessed on at least three occasions. The Hon. H. Hope thus records his observations: "Having killed a female kangaroo, I was rather surprised and interested to see an embryo working its way up towards the orifice of the pouch. The dam that I had shot had been dead perhaps five minutes before I noticed what was going on, but I do not think that sufficient time had elapsed for the young to have made its way so far. The embryo looked like a piece of raw flesh. It was working actively with its forelegs, which were, in fact, considerably developed, with the claws apparent. It was about one and a third inches in length, and the tail and hind-legs were undeveloped, giving the hinder parts of the animal the appearance of a red grub.

"After watching it for a few minutes, and not having much time to remain, I took it from the fur, to which it seemed to adhere pretty firmly, and placed it close up to the orifice of the pouch. It soon left this, however, and commenced travelling through the fur, which was pretty long, with considerable energy. As, however, it began to describe circles, and appeared to have lost its way, I placed it again at the orifice of the pouch. It then seemed to endeavour to burrow in. At this stage I had to leave, as the day was advancing."

Mr Hope further states: "I heard lately of the same occurrence having been observed by a kangaroo-hunter, and was pleased to find the confirmation of his story by my own experience. His opinion was that the embryo had been extruded by the dam in its dying agonies, and he described almost exactly what I afterwards saw, that the embryo was working its way through the fur straight to the orifice of the pouch." [1]

This observation has been further confirmed by Mr Gourling, of Marloo Station, Murchison district, Western Australia. He states: "I had a number of *M. rufus* and *M. cervinus* in my possession, and one morning I was attracted by the peculiar behaviour of a female *rufus*; she refused the food placed before her. Seeing blood-marks in the cage, I came to the conclusion that she had just given birth to a young one. She was sitting in that resting position that kangaroos are so often seen in, the tail passed forward through the legs. She took no notice of my presence, although not more than three weeks in captivity, and was busy licking and cleaning herself. Presently she raised her head, and I was astonished to see a young kangaroo clinging to the long fur about four inches below the opening of the pouch. It moved slowly, very slowly, through the fur upwards, using the arms in its progress, and continually moving its head from side to side. Nearly thirty minutes were required by the little wanderer to reach the top of the pouch. During the whole of this time, the mother paid no attention to her offspring, leaving it entirely to its own exertions. Now, I had a female *M. woodwardi* in captivity, and noticing bloodstains in the cage, believed that she had been hurt; I then noticed just such a young kangaroo clinging to the fur below the pouch, and thought that the mother, by her restless movements, had dislodged it." [2]

In this connexion it may be mentioned that the American opossums have been seen to be born and make their way to the nipples in just the same manner. This has been observed and fully described by Dr Carl G. Hartman (*Anatomical Record*, xix, 1920, p. 251), who says that the young are born when the mother is in a sitting position, with the legs extended. Unerringly the young travels by its own efforts, without any assistance on the mother's part other than to free it of liquid on its first emergence. After its arrival in the pouch it is able to find the nipple and attach itself. Experiments made by removing the young and placing them outside the pouch again show that they travel upward instinctively, and if the skin is tilted they follow the upward trend. For locomotion the young employs a kind of overarm stroke. The head swings as far as possible to the side opposite to the hand which is making the propelling stroke; with each turn of the head the snout is touched to the mother's skin as if to test it out; and if the nipple is touched the embryo stops and at once takes hold.

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[1] *Proc. Phil. Soc.*, Queensland, iii, 1881, p. 1.

[2] *Western Mail*, Perth, Western Australia, January 3, 1913.

This is in perfect agreement with what has been observed in regard to the kangaroo.

Wild kangaroos and wallabies are preyed upon by the dingo, fox, and the wedge-tailed eagle, which take the young when opportunity offers, but comparatively few large kangaroos are destroyed in this way. Kangaroos are at times heavily infested with internal parasites, and this no doubt reduces their resistance, but their chief trouble is the sandflies, which are abundant in certain parts after rain. These sting the kangaroos' eyes when they come to water; the eyelids swell, and the animals become blind. Often little mobs will be seen which have been killed in this way.

Enormous numbers of kangaroos and wallabies are killed for their skins. In country where water is plentiful shooters walk or ride after them, but in the north and north-west hunters just wait by water-holes and shoot the animals as they come in. Knowing well the danger, the animals come warily, but are picked off by the shooters. The old males are the last to come in, and do so only when raging thirst overcomes their caution.

Mr H. K. Batchelor mentions that from 1877 to 1902 the Queensland Government paid for 7,407,863 kangaroo and wallaby scalps. He further states that on one station in Queensland 60,000 kangaroos were killed in six months.[1]

Key to Species of Macropus

KANGAROOS

1. Hind-foot more than 260 mm. long	
A. Nose hairy between nostrils	
a. Back of ears furred	
Fur fine, grey to greyish brown	*M. giganteus giganteus*
Fur long, coarser, grey, sooty grey, rusty brown, or rusty red	*M. g. tasmaniensis*
a^1. Back of ears bare or covered with short adpressed hairs. Body colour dark chocolate	
Fur short and fine. Form light, graceful	*M. melanops*
Fur long, coarse. Form robust, heavy	*M. fuliginosus*
B. Nose naked between nostrils	
b. Fur coarse, short, straight. No face-markings	*M. antilopinus*
b^1. Fur long, thick, abundant. No face-markings	
Male smoky black, female smoky grey	*M. robustus robustus*
Both sexes pinkish grey	*M. r. erubescens*
Male wine-red, shaded grey	*M. r. reginæ*
Both sexes rufous isabelline; male may be darker	*M. r. isabellinus*
Both sexes deep rufous or brownish fawn	*M. r. cervinus*
Fur shorter, lighter in colour, especially in female	*M. r. rubens*
Male foxy red, female fawn	*M. r. woodwardi*
Both sexes forepart vinaceous fawn, hinder part brownish fawn	*M. r. alligatoris*
Male forepart bright rufous, washed with purple, hinder parts roan, female silvery grey	*M. r. argentatus*
Male black, suffused with rusty brown, female fawn grey	*M. bernardus*

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[1] *The Lone Hand*, Sydney, October, 1909, p. 626.

C. Nose partially naked between nostrils	
c. Fur soft, woolly. Face-markings present	
Fur short. Male rufous with throat more or less pink, female bluish grey or rufous grey . . .	*M. rufus rufus*
Fur longer and coarser. Either sex may be rufous or blue grey, throat white	*M. r. occidentalis*
Fur very short, thin, pale rufous fawn	*M. r. pallidus*
Fur thick, woolly, mahogany chestnut	*M. hagenbecki*

Large Wallabies (*Wallabia*)

2. Hind-foot from 160 to 250 mm. long	
A. Fur long. Hip-stripe inconspicuous or absent except in *M. dorsalis*	
a. Tail blackish. Base of ears yellow or rufous	
Fur blackish brown. Markings inconspicuous	*M. ualabatus ualabatus*
Fur fawn brown. Face-markings present	*M. u. apicalis*
Fur buffy grey. Body- and face-markings conspicuous . . .	*M. u. ingrami*
*a*¹. Tail grey or whitish. Base of ears like rest of head	
Fur rufous grey, neck rufous. No stripe down back. Face-markings inconspicuous	*M. ruficollis ruficollis*
Similar. Fur smoky grey and longer	*M. r. bennettii*
Top of muzzle light grey. Face-markings conspicuous . . .	*M. greyi*
Fur orange rufous. No body- or face-markings	*M. welsbyi*
Black stripe centre of back; hip-stripe	*M. dorsalis*
Ears particoloured behind. White stripe on nape	*M. parryi*

- Tail with distinct crests above and below . . . . . . *M. irma*

B. Fur short, uniform sandy or yellowish. White hip-stripe. . . . *M. agilis*

Small Wallabies (*Thylogale*)

3. Hind-foot less than 150 mm. long

A. Round base of ears and back of lower leg bright clear rufous

- Fur short, coarse, sparse, dark sandy. White hip-stripe . . . . *M. coxeni*
- Fur soft, thick, brownish grey, rufous markings
  - Hip-stripe prominent. Flanks rich red. North-east Queensland . *M. stigmaticus*
  - Hip-stripe indistinct or absent. Flanks rufous grey. South-east Queensland and New South Wales *M. wilcoxi*

B. Round base of ears and base of lower leg grey or brown

- Fur thin, sparse, uniform chocolate brown
  - Back of ears black. White hip-stripe *M. brunii*
  - Back of ears brown like head. No hip-stripe . . . . . *M. browni*
- Fur long, thick, mottled on back
  - Tail more than three times length of head
    - Nape rich rufous, no trace of a nuchal stripe . . . . *M. thetidis*
    - Nape dull rufous or grey, a broad nuchal stripe. West and South-west Australia . . . . *M. eugenii*
    - General colour pale isabelline fawn. Queensland . . . . *M. bedfordi*
    - Nape, shoulders, back dull grizzled rufous, nuchal stripe narrow, well defined. South-east Australia . *M. parma*
  - Tail barely two and a half times length of head
    - Forequarters brown like head

Fur soft, thick. South-east Australia,
Tasmania . . . . . *M. billardieri*
Fur coarse, harsh. Ears very short.
Western Australia . . . *M. brachyurus*

Note. The males in the kangaroos and in some of the larger wallabies continue to grow throughout their lives, and exceptionally large specimens which do not represent the average develop under favourable conditions. In the kangaroos and large wallabies the females are about one-third to one-quarter less in size than the average males. In the small wallabies the difference in size is not marked.

Group 1. *Kangaroos*

The great grey kangaroo, or forester, as it is commonly called, is found in the open forest country, and seldom ventures far away from the protecting timber. Generally speaking, this species is coastal, rarely living more than three hundred miles away from the sea. It is gregarious, and runs in mobs of from 6 to 50, though occasionally solitary old males may be found. This kangaroo's habitat in Eastern and Southern Australia is now occupied by the pastoralist and the farmer, so that it may be said to exist on sufferance. The typical 'greys' are perhaps more scarce than any other species of kangaroo, though they are still fairly plentiful on the protected foothills in certain parts of the Great Dividing Range. The western form is a little darker in colour, but otherwise similar. The Tasmanian type varies more in colour, ranging from grey to smoky grey or sooty red ; it also has longer and coarser fur, but is otherwise the same as *M. giganteus*, and has the same measurements. The western form is often confused with *M. melanops*, and the Tasmanian variety has been considered to be *M. fuliginosus*, which, however, is confined to Kangaroo Island, and is quite a different species.

Allied to the grey kangaroo is the black kangaroo, *M. melanops*. This species, although its teeth are practically the same as in *M. giganteus*, is smaller and lighter in build, has the upper two-thirds of the ears covered with fine hairs or naked, and is different in habits and habitat. The black kangaroo keeps to the scrub or the long river-grass. It does not come into the open forest, which is the domain of the 'grey,' though it will be found in open glades in the evening, feeding on the grass. Unlike the 'grey,' the 'black' is found only singly or in pairs; nor does it migrate so much from place to place, for when the grass gets short and the 'greys' have to move on, the 'blacks' will feed on the bark of the scrub-trees and maintain themselves over the dry period.

Mr Walter Turnbull, of Boorindal, New South Wales, a careful observer, states, in referring to *M. melanops*: "The bucks grow fairly large, in rare cases almost equal to the Grey. I had a Black skin that measured 44½ inches across the chest, and the biggest Grey I had measured 46½. They show fight very quickly when wounded or chased by dogs, and are savage; they back up against a tree or a log, and it takes a good dog to shift them. I have never found one affected by lice, though some of the Greys are teeming with them. In my experience I have found the Blacks equally numerous with the Greys, but this depends on the season; for as soon as the feed is giving out the Greys clear out, but the Blacks remain."

There has been a good deal of confusion about *M. fuliginosus*. Thomas states (*Cat. Mars. and Monot. Brit. Mus.*, p. 19): "The original habitat of this form was said to be Kangaroo Island, South Australia, where Desmarest states, but with some doubt, that it was obtained by Peron and Lesueur. This doubt is confirmed by the fact that (*vide* Gould) it does not exist on Kangaroo Island, and by its common occurrence in Tasmania, where those collectors were for a considerable time."

From this it would appear that Gould never actually saw a specimen of the Kangaroo Island kangaroo. He seems to have presumed that the Tasmanian animal was the same, and other naturalists have followed this lead. This is a mistake, as the Kangaroo Island animal is quite different, being shorter and broader, and having very different skull measurements. Comparison of the original description, and also of that by Waterhouse of the types now in the Paris Museum, with specimens recently taken from the island show that Peron and Lesueur's types were from Kangaroo Island.

This species was, in 1921, fairly numerous on the island, living among the thick scrub of the ironstone ridges. Mr Ellis Le G. Troughton, who went to secure some for the Australian Museum, states: "The kangaroos were usually in small groups amongst the thick dwarf scrub which covers most of the island. We often surprised them resting in the clear places in the midst of thick, prickly bushes, when they would go crashing away through the low undergrowth. The dark brown of the animal blended well with the rather sombre brown or yellowish prevailing tints of the vegetation and with the ironstone country of the more open places. The animals were quite speedy in spite of their heavy build, and we found a good dog essential to their capture."

The antilopine kangaroo is confined to the far north, inhabiting the open plains of Arnhem Land. It is gregarious, and rather hard to approach. This species stands very erect, like *M. parryi*. Owing to their short thin coats they do not live very well in the south; a number kept in captivity in Sydney did not reach their full size or live longer than eight years. They were, too, much lighter in colour than those described in the British Museum catalogue, and may be a sub-species. The species is comparatively rare.

The wallaroo is a powerful, thickset animal, especially adapted for life in the mountains. Here it will be found singly or in pairs, generally in the open scrub-lands of the hillsides. So well does their colour, especially that of the male, harmonize with their sombre surroundings that unless on the move they are difficult to see, though they may be surprised feeding in the open country. Like that of the grey kangaroo, the domain of the typical wallaroo has nearly all been occupied by the settlers. The wallaroos, therefore, are somewhat scarce, and, unless given a special sanctuary, will become very much more so as the country is more closely occupied, and the accuracy and cheapness of small-bore rifles increase. In referring to this species Mr S. H. Donovan states : " It is seen on its own. You will not see more than one, two, or three together. They never leave the forest. When pushed for water they will, like the rabbit, bark the green saplings. They are hard to see, as they harmonize so well with the surroundings."

Owing to the ranges in Australia being more or less isolated, the mountain kangaroos have a discontinuous habitat, and consequently have developed a number of sub-species. While some of these are little more than colour varieties of the typical form, others have developed fairly definite differences. The eastern species, inhabiting the mountain ranges, is dark in coloration. Farther west, in the drier regions, they become more or less rufous. On the coastal regions of Western Australia this, in the form of *M. robustus woodwardi*, becomes more pronounced. On the more or less sandy, scrubby Barrow Island the form *M. robustus isabellinus* is lighter. Farther north, in better country, but where ironstone ridges predominate, the animals are again darker and larger. From the Northern Territories several forms have been described, some of which are probably seasonal variations of *M. r. alligatoris*, as the ordinary wallaroo of the east varies very considerably in summer and winter. *M. bernardus* is very like *M. robustus*, but smaller, with proportionately shorter ears, and a much thinner coat, owing to the hotter climate. This species lives in the granite ranges, sheltering among the bushes, and is difficult to procure owing to the precipitous country that it inhabits.

The wallaroos are determined fighters ; they use their teeth more than other kangaroos, and one has to be careful in approaching old males ; when hunted they make for the rocks.

The red kangaroo is the kangaroo of the open plain, with a very wide distribution over the central districts. It occupies the drier areas, and is seldom found within 500 miles of the coast. This species is gregarious, and will be found in mobs of six to a dozen or so, resting under trees during the day and moving off to feeding-grounds during the late afternoon. There are three sub-species. The eastern type has the male red and the female blue grey or dull rufous, with the throat of the buck usually pink; the western form has longer hair, is often of a brighter colour, and either sex may be rufous or grey; the throat and often the chest is white. A third form has very short light pinkish-fawn fur.

GREAT GREY KANGAROO

Macropus giganteus giganteus, Zimmermann. Australia, except centre and north, open forest. *Cat. Mars. and Monot. Brit. Mus.*, p. 15.

Fur variable in length and thickness; in summer it may be short and close, in winter longer, with rather thick woolly under fur; hair much shorter in old males and longer in young males and females. General colour grey, blackish grey, or greyish brown; specimens from north with yellowish tinge, those from west browner; under sides lighter; paws, toes, tip of tail blackish; arms and legs whitish; face coloured like back, with indistinct dark whisker-marks. Ears with backs coarsely haired, fringed inside with white hairs. Male: head and body, 1500 mm.; tail, 930 mm.; hind-foot, 337 mm.; ear, 100 mm. Female: head and body, 1170 mm.; tail, 730 mm.; hind-foot, 278–298 mm.; ear, 98 mm. (See Fig. 1.)

TASMANIAN KANGAROO

Macropus giganteus tasmaniensis, Le Souef (not *M. fuliginosus*, Desmarest). Tasmania. Gould, *Mamm. Aust.*, ii, Pl. 5; *Aust. Zool.*, iii, 4, 1923, p. 146.

Hair rather long, coarse. Colour of upper parts may be grey, sooty grey, rusty brown, or rusty red; as general rule colour is rusty brown, with under parts greyish; toes and end of tail black. Back of ears well furred, fringed inside with white hairs. Male: head and body, 1400 mm.; tail, 1000 mm.; hind-foot, 380 mm.

BLACK-FACED KANGAROO

Macropus melanops, Gould. Eastern, Southern, and Western Australia, scrub and bush. *Cat. Mars. and Monot. Brit. Mus.*, p. 20 ; *Aust. Zool.*, iii, 4, 1923, p. 146.

Hair short, fine, more so in males. General colour of back rich chocolate brown ; under parts whitish, owing to hairs being white-tipped ; lighter on arms and legs ; paws, toes, and end of tail black ; face usually darker than rest of body, with inconspicuous whisker-marks. Terminal three-quarters of back of ears almost naked, or covered with short fawn-coloured adpressed hairs ; inside of ears conspicuously fringed with white hairs. General build distinctly lighter and more slim than in *M. giganteus.* Specimens from Western Australia may be lighter in coloration. Male : head and body, 1050 mm. ; tail, 950 mm. ; hind-foot, 345 mm. ; ear, 114 mm. (See Fig. 22.)

KANGAROO ISLAND KANGAROO

Macropus fuliginosus, Desmarest. Kangaroo Island. *Dict. Hist. Nat.*, (2) xvii, 1817, p. 35 ; *Aust. Zool.*, iii, 4, 1923, p. 146.

General build heavy, robust. Hair long, coarse. Colour above in winter black, with under parts white ; arms and legs lighter ; feet, hands, tail black ; in summer general colour above sooty brown, shading through sooty fawn to grey on throat, where hairs are ashy grey basally and white terminally ; face evenly coloured ; ears dark on outside, sparingly covered with stiff hairs, and fringed inside with white hairs, with light spot on posterior base ; hairs on metacarpals and metatarsals black, with whitish tips ; stiff hairs on fingers and toes black throughout. Tail long-haired for about one foot at base, then covered with short, stiff, adpressed dark brown hair, blackish on central line above and terminally ; under parts somewhat flattened and clay-coloured. Male : head and body, 1090 mm. ; tail, 950 mm. ; hind-foot, 319 mm. Female : head and body, 869 mm. ; tail, 740 mm. ; hind-foot, 264 mm. (See Fig. 23.)

ANTILOPINE KANGAROO

Macropus antilopinus, Gould. Arnhem Land, Northern Territory. *Cat. Mars. and Monot. Brit. Mus.*, p. 21.

Form stout, heavy. Fur very short, coarse, straight; under fur absent. Muzzle with large naked rhinarium. General colour varying from rich rufous to pale foxy red in male, and fawn in female; chin, chest, belly, inner parts of limbs whitish; hands and feet becoming rufous brown and black on fingers and toes. Central hind-claw very short, projecting only about two-thirds of inch beyond foot-pad. Tail darker on extreme tip. Male: head and body, 1390 mm.; tail, 890 mm.; hind-foot, 320 mm.; ear, 76 mm. Female: head and body, 1000 mm.; tail, 700 mm.; hind-foot, 273 mm.; ear, 90 mm. (See Fig. 24.)

WALLAROO

Macropus robustus robustus, Gould. Mountain country of Eastern Australia, from South Queensland to New South Wales. *Cat. Mars. and Monot. Brit. Mus.*, p. 23.

Male: Form stout, heavy. Fur of medium length to long, straight, thick, coarse; not much under fur. General colour above in winter greyish black, sometimes with conspicuously white chest and belly (especially in southern forms); in summer colour of back tends to smoky brown, with under parts greyer; arms, legs, tail generally dark brown, tail becoming black distally; throat of old males may be suffused with pink in winter. Head and body, 1150 mm.; tail, 840 mm.; hind-foot, 280 mm.; ear, 130 mm.

Female: Fur longer. General colour above smoky grey, with chest little lighter; fingers and toes black; tail greyish white, tip brown; in summer the body colouring becomes more suffused with brown. Head and body, 760 mm.; tail, 600 mm.; hind-foot, 245 mm.; ear, 120 mm. (See Fig. 25.)

22. Black-faced Kangaroo (*Macropus melanops*), Male

23. Kangaroo Island Kangaroo (*Macropus fuliginosus*),
Female

24. Antilopine Kangaroos (*Macropus antilopinus*)

25. Wallaroo (*Macropus robustus robustus*), Male

EURO

Macropus robustus erubescens, Sclater. Northern part of state of South Australia to Central Australia. *Proc. Zool. Soc.*, 1870, pp. 126, 669.

General colour above pinkish or rufous grey, mixed with black hairs, except on nape and upper back; below paler; tail pale brown; hands and feet blackish; ears blackish on outer surface, nearly naked, sparingly covered with very short coarse black hairs; vertical stripe between ear and nose black; female generally paler in colour. Measurements same as in *M. r. robustus.*

NORTH QUEENSLAND WALLAROO

Macropus robustus reginæ, Schwarz. North-eastern Queensland. *Nov. Zool.*, xvii, 1910, p. 113.

Much as in *M. r. erubescens.*

Male: Upper surface light wine red, strongly mixed with slate grey, the hairs, except on the neck, having grey tips; hairs of the under surface ash grey at the base, with whitish-grey tips; toward the sides the lighter tips are absent, so that a light ash-grey stripe is present, running from the shoulders along the sides of the belly to the hips; breast yellowish white; a blackish spot on the crown; chin, temples, and base of the ear are brighter red than the neck; tip of the nose, forehead, and cheeks dark brown, sprinkled with white; the posterior side of the ears is thickly set with long black hairs, and the inner side with long yellowish-white hairs; arms yellowish mixed with black, paws not or only slightly darker; legs yellowish. Head and body, 1060 mm.; tail, 825 mm.; hind-foot, 292 mm.; ear, 102 mm.

ISABELLINE WALLAROO

Macropus robustus isabellinus, Gould. Barrow Island, North-west Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 25.

Fur of medium length, soft, fine. General colour above buffy red, paler on flanks, where it merges into white of under surface; throat white; large oval patch of grey on chin; upper arm and chest white; belly tinged with yellowish; top of hips and middle of leg grey; lower forearm brown, becoming darker toward fingers; feet same; hair on large toe black, with brown tips, that of other toes golden brown; sides of head brownish; ears brown on back, white inside; muzzle grey above; margin of upper lip white; tail uniform yellowish buff, with exception of basal portion, upper part of which is coloured like body, lower part white. Head and body, 1020 mm.; tail, 815 mm.; hind-foot, 235 mm.; ear, 75 mm. Female more fawn and proportionately smaller.

DEER-COLOURED WALLAROO

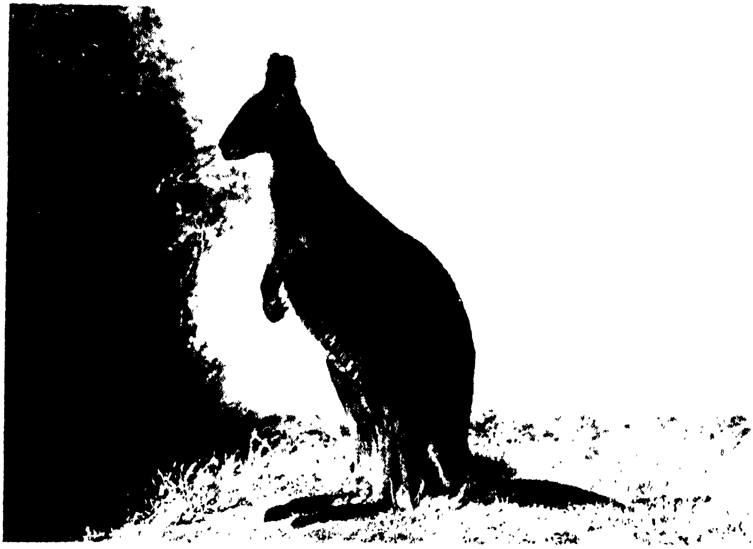
Macropus robustus cervinus, Thomas. Murchison district, Western Australia. *Proc. Zool. Soc.*, 1900, p. 113; *Nov. Zool.*, viii, 1901, p. 395.

Upper surface deep rufous fawn or brown; hair evenly coloured; chin, throat, centre of belly whitish, not sharply defined; limbs whitish, darker on fingers and toes; tail pale sandy rufous, tip black. Measurements as in *M. r. robustus*. (See Fig. 26.)

Macropus robustus rubens, Schwarz. North-west Australia. *Nov. Zool.*, xvii, 1910, p. 100.

Male: Similar to *M. r. cervinus*, but with shorter and lighter hair, especially on head and neck, which have somewhat yellowish sheen; belly reddish; chest and throat white; back of ears blackish brown, sparingly haired.

Female: Very variable. General colour above yellowish red; hairs without dark points; greyer on nape; sides of body lighter; under sides with only small median white streak; head and body lighter; inside of ears white-haired; nose blackish brown; arms and legs yellowish; darker toward extremities.



26. Deer-coloured Wallaroo (*Macropus robustus cervinus*), Male

Red Kangaroo (*Macropus rufus rufus*), Male

28. Woodward's Wallaroos (*Macropus robustus woodwardi*)
Males

29. Woodward's Wallaroo (*Macropus robustus woodwardi*),
Female

WOODWARD'S WALLAROO

Macropus robustus woodwardi, Thomas. Murchison district, Western Australia. *Nov. Zool.*, viii, 1901, p. 395.

Male : Fur shorter, thinner, harsher than in *M. r. cervinus* ; fur of nape and fore-back more or less reversed, former from dividing whorl on withers. General colour above, including head and ears, middle of tail, and proximal outer side of limbs, bright rufous ; digits indistinctly blackish ; remainder of limbs, tail, and under parts dull whitish. Head and body, 1250 mm. ; tail, 800 mm. ; hind-foot, 290 mm. ; ear, 90 mm. (See Fig. 28.)

Female: Fawn, varying in shade; lighter in summer, darker in winter. (See Fig. 29.)

ALLIGATOR RIVER WALLAROO

Macropus robustus alligatoris, Thomas. South Alligator River, Northern Territory. *Nov. Zool.*, xi, 1904, p. 224.

Fur nearly as short and close as in *M. r. woodwardi*; much shorter than in other sub-species; hairs of centre of fore-back and nape reversed forward as in that species. General colour much the same as in *M. r. erubescens*, but less richly rufous above and duller below ; fore-neck, crown, ears, arms dull vinaceous fawn, darkening to brownish fawn on rump; long hairs of inner side of ears whitish; muzzle and chin with prominent brown patch; throat, chest, belly dull brownish white, passing laterally and below into vinaceous fawn; digits blackish; feet paler fawn, becoming dark reddish brown on base and back of ends of central digits; tail short-haired, dull fawn, base whitish below: Measurements same as in *M. r. woodwardi.*

SILKY-HAIRED WALLAROO

Macropus robustus argentatus, Rothschild. Northern Territory. *Nov. Zool.*, xii, 1905, p. 509.

Male : Hair long, thick, silky. Basal half of ears, occiput, hind-neck, shoulders, and anterior half of body bright rufous washed with purple; anterior half of ears, face, forearms, lower part of hind-legs, and anterior half of tail blackish; posterior half of body mixed with black hairs, giving dark appearance. Young male grey, with slight shade of red in places.

Female: Silvery grey all over, mixed with ashy grey, giving animal appearance of large chinchilla; lower flanks almost white; anterior two-thirds of tail yellowish grey.

BERNARD'S WALLAROO

Macropus bernardus, Rothschild. South Alligator River, Northern Territory. *Nov. Zool.*, xi, 1904, p. 225.

Male: Hair straight, medium length, rather thin and coarse, in winter evenly shining black all over; with advent of summer colour gradually changes to rusty black, especially on back; at end of summer animal has patchy appearance, owing to old coat being shed irregularly over body. Head and body, 830 mm.; tail, 700 mm.; hind-foot, 250 mm.; ear, 80 mm. (See Fig. 30.)

Female: In winter evenly light grey all over body; in summer this changes to brownish grey above, with flanks and under parts dull fawn; paws and feet black; tip of tail dark brown; face evenly coloured, with black nose. Head and body, 645 mm.; tail, 450 mm.; ear, 63 mm.; claw of hind-foot very short, exceeding the pad only by 6 mm. (See Fig. 31.)

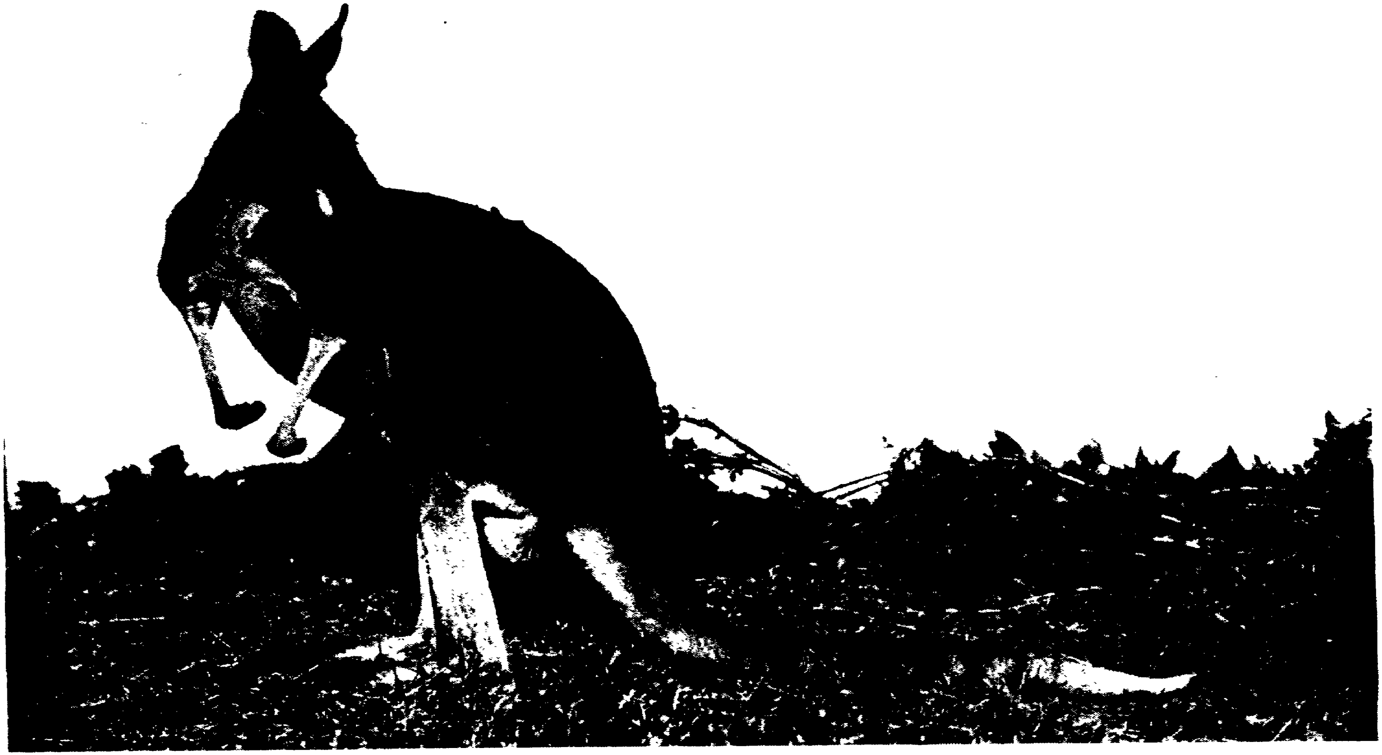
RED KANGAROO

Macropus rufus rufus, Desmarest. Inland Australia, open plain country. *Cat. Mars. and Monot. Brit. Mus.*, p. 26.

Male: Largest of genus. Fur short, close, woolly, formed of under fur and not lying in any given direction. Muzzle with naked rhinarium intermediate between *M. giganteus* and *M. robustus*. General colour above varying from chestnut red, bright pinkish rufous, to dull greyish white; in winter more or less suffused with blue grey, especially on hind-neck and shoulders; this colour often in patches over

30. Bernard's Wallaroos (*Macropus bernardus*), Males

31. Bernard's Wallaroo (*Macropus bernardus*), Female



32. WESTERN RED KANGAROO (*Macropus rufus occidentalis*), MALE
Note white throat and chest.

back, chest, arms from the elbows; legs from the knees, groin, and anal region whitish; throat usually bright pink; belly rufous; face blue grey, with conspicuous white whisker-marks, faint in old males, more developed in young and females; ears grey or brownish outside and sparsely haired; fingers and toes black; tail grey or fawn grey, not darker toward end. Head and body, 1610 mm.; tail, 1060 mm.; hind-foot, 360 mm.; ear, 110 mm. (See Fig. 27.)

Female: Hair longer and coarser, rufous basally, and blue grey terminally, with more or less rufous showing through, especially on curves of body; chest, arms, legs, and tail lighter; feet and toes black. Face-markings conspicuous. Head and body, 833 mm.; tail, 665 mm.; hind-foot, 275 mm.; ear, 100 mm. Some specimens, especially in summer, are more rufous throughout, others may be blue grey to base of hairs.

WESTERN RED KANGAROO

Macropus rufus occidentalis, Cahn. Mid-western Australia. *Zool. Beobachter*, xlvii, 1906, p. 361, xlviii, 1907, p. 3; *Nov. Zool.*, xvii, 1910, p. 89.

Fur much longer than in *M. r. rufus*, owing to straight hairs coming through and covering the more or less woolly under fur. Colour very variable; either sex may be grey or rufous, but usually male is rich foxy red above, with throat and middle of chest white; pale examples are not uncommon, and grey ones rare. General characters and size same as in typical form. Female usually pale grey, but may be dull rufous. (See Fig. 32.)

PALE RED KANGAROO

Macropus rufus pallidus, Schwarz. Shaw River, North-west Australia. *Nov. Zool.*, xvii, 1910, p. 89.

Form and general characters as in *M. r. rufus*, but fur very short and pale rufous fawn. Male: head and body, 1325 mm.; tail, 875 mm.; hind-foot, 375 mm.; ear, 175 mm.

OWEN'S KANGAROO

Macropus magnus, Owen. North-west Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 27 ; *Nov. Zool.*, xvii, 1910, p. 89.

This species was originally described by Owen from a single skull, and was subsequently stated by Thomas to be most nearly allied to *M. rufus.* Since then Schwarz has definitely regarded it as a synonym of *rufus.*

HAGENBECK'S KANGAROO

Macropus hagenbecki, Rothschild. North Australia. *Nov. Zool.*, xii, 1905, p. 509 ; xiv, 1907, p. 333; xvii, 1910, p. 108.

Size of *M. rufus.* Hair short, very thick, woolly, as in *M. rufus*, but exaggerated. General colour above deep mahogany chestnut; ears and face blackish; blue-grey band on shoulder and at bend of thighs; forelegs, hind-legs, and anterior two-thirds of tail blackish.

Group 2. *Large Wallabies*

For the sake of convenience the smaller kangaroos are called wallabies. Practically the only external difference between them and the kangaroo proper is that the wallabies have a more hairy tail, though this may be only a few long stiff bristles at the tip. Their feet are larger in proportion, their palate is more incomplete, while the third incisor is always provided with a single well-marked notch about the centre of the tooth. The molars have, at the antero-external corner of the tooth, a well-marked connecting ridge joining the anterior transverse ledge to the body of the tooth, while on the other hand the anterior connecting ridge, predominant in most of the kangaroos, is small or entirely absent.

As necessitated by their smaller size, all wallabies live in or about scrub or brushwood, for they have three enemies ever on the look-out for stray animals that venture into the open, namely, the dingo, fox, and the great wedge-tailed eagle. Wallabies are usually found singly or in pairs, though occasionally a number may be found together in some thick cover to which they have retired during the day.

M. ualabatus, known as the black and also as the swamp wallaby, inhabits scrubby damp gullies, through which it has well-marked paths or ' wallaby tracks.' This species, ranging from Victoria to North Queensland, naturally varies a good deal. The farther north it goes the lighter and more brightly marked it becomes. In the southern part of its range it is very numerous, and great numbers of skins are annually exported. These are good for hard serviceable wear ; dyed and polished the winter pelage is sold as skunk wallaby; it makes a handsome trimming.

The red-necked wallaby, commonly known as the scrub and in places as the brush wallaby, is found in the drier forest country of Eastern Australia. Though at one time very numerous, it is becoming rather scarce, as its habitat is opened up by advancing settlement. Its close ally, Bennett's wallaby, often called the kangaroo in Tasmania, is found in the more dense forests, and has a much thicker and more valuable fur. This southern form is hardy and resistant to cold, and does very well both in zoological exhibitions and in a semi-wild state in Europe.

Grey's wallaby, known as the ' toolach,' is now very scarce. It is confined, as far as can be ascertained, to a small area of scrub-land inland from the mouth of the Murray River, South Australia.

The black-striped wallaby is the common form in South-eastern Australia. It is found in rough, open country, and will often be put up from under the head of a fallen tree, where it has been hiding during the day. The black stripe and white mark on the thigh, which give it the name of the ' thigh-stripe,' are prominent distinguishing characters.

Parry's wallaby is a very beautiful species. It can be readily distinguished by its markings, from which it derives the name of ' pretty face,' or by its long slender tail, which gives it another local name, the ' whip-tail.' Parry's wallaby inhabits the more open country of the ranges from Northern

New South Wales to Northern Queensland, relying on its wonderful speed to escape from its enemies. It is rather more gregarious than the other wallabies. In the northern part of its range it is, as might be expected, more fawn in colour.

The black-gloved wallaby is still very numerous in South-west Australia. It lives in open forest country, where the ground is more or less covered with low bushes, under which it takes cover during the day, and from which single specimens will often be disturbed. They are very fast. This species, strangely enough, is difficult to keep in captivity; evidently it requires special food to keep it in health.

The agile wallaby is a tropical species, having a wide range over Northern Australia and New Guinea. Its light fawn colour and short ears will serve to distinguish it from other species of its size. The particular habitat favoured by the agile wallaby is long-grassy, low-lying ground. In very dry weather it will feed on the succulent roots of the rushes. In the north-west, near Kimberley, there is a more yellowish form, which has been noted to take shelter during the day in a hole or at the butt of a hollow tree. Near Broome a darker form is found adjoining the sandy beaches.

BLACK-TAILED WALLABY

Macropus ualabatus ualabatus, Lesson and Garnier. South-eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 30.

Fur long, thick, rather coarse; under fur long and soft. Colour somewhat variable; general colour above dark greyish brown on back; fore-quarters coarsely grizzled grey; under parts more or less brownish buff; crown, base of ears, outside of elbows buffy; blackish whisker-mark from muzzle to eye indistinct; whitish cheek-stripe; dark mark just behind elbow; hands and feet brown, becoming black at fingers and toes; tail black, proximal half sometimes grizzled with grey. Head and body, 815–820 mm.; tail, 650 mm.; hind-foot, 208 mm.; ear, 63 mm. (See Fig. 33.)

Black-tailed Wallaby (*Macropus ualabatus ualabatus*), Male, Southern Form

34. Black-tailed Wallaby (*Macropus ualabatus apicalis*), Female, Northern Form

35. Red-necked Wallaby (*Macropus ruficollis ruficollis*)

36. Bennett's Wallabies (*Macropus ruficollis bennettii*)

Photo S. T. Leigh and Co., Sydney

Macropus ualabatus apicalis, Gunther. Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 32.

General colour above varying from greyish brown to grizzled buff ; brown mark on side of face continued through eye to just in front of ear, sharply separated below from white whisker-mark ; tail blackish proximally, may be white-tipped. Measurements as in typical form. (See Fig. 34.)

Macropus ualabatus ingrami, Thomas. North Queensland. *Proc. Zool. Soc.*, 1908, p. 788.

General colour light buffy grey ; buff more prominent on posterior part of body ; under surface grey, washed with rich tawny buff ; prominent light buff areas at base of ears continuous with lateral face-stripes, and practically meeting on crown ; back of ears black, with light margins ; forehead with indistinct median black stripe ; fore-limbs bright buffy grey, contrasting strongly with dark marks behind them ; hands and feet black ; tail black distally, tip white. Head and body, 630–640 mm. ; tail, 640 mm. ; hind-foot, 195 mm. ; ear, 78 mm.

RED-NECKED WALLABY

Macropus ruficollis ruficollis, Desmarest. South-eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 32.

Nose naked, as in all other wallabies except *M. agilis* and *M. irma* ; hair not growing between nostrils. General colour above greyish fawn, grading into rufous on neck and rump ; indistinct whitish hip-mark sometimes present ; under fur thin, brownish rufous ; face-markings inconspicuous ; top of muzzle dark brown, connecting lateral whisker-marks, below which are indistinct whitish cheek-stripes ; crown of head rufous grey ; hands and feet grey, becoming blacker at end of digits ; under parts greyish white ; tail grey above, white below, with longer pencil of black hairs at tip. Head and body, 690–900 mm. ; tail, 650–765 mm. ; hind-foot, 240–250 mm. ; ear, 98 mm. (See Fig. 35.)

BENNETT'S WALLABY

Macropus ruficollis bennettii, Waterhouse. Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 35.

Fur longer, denser. General colour dark grey, brownish on back of neck and rump ; back of ears nearly black ; under parts greyish white ; tail dark grey. Head and body, 895 mm. ; tail, 690 mm. ; hind-foot, 204 mm. ; ear, 65 mm. (See Fig. 36.)

GREY'S WALLABY

Macropus greyi, Gray. Western part of Victoria and south-eastern part of state of South Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 36.

Dark greyish-fawn back, becoming more rufous on nape and back of head ; under fur rather thick and woolly, slaty at base, rufous at tip ; ears rufous, behind their edges blackish ; tip of muzzle pale grey ; fur bordering naked rhinarium black for about half an inch ; sides of muzzle with black whisker-mark from nose to eye, sharply bordered below by clear white cheek-stripe, which involves edges of mouth, and passes backward under eye nearly to ear ; arms, hands, legs, feet whitish ; fingers and toes black, central posterior claws slender and long, exceeding pads by more than inch ; belly pale grey, with tinge of rufous ; tail very pale grey, becoming whiter at tip, indistinct upper and lower crests on distal half. Head and body, 810–840 mm. ; tail, 710–730 mm. ; hind-foot, 212–216 mm. ; ear, 65–71 mm.

RED STRADBROKE ISLAND WALLABY

Macropus welsbyi, Longman. Stradbroke Island, Queensland. *Mem. Qld. Mus.*, vii, 1922, p. 298.

General form robust. Fur fine, silky in texture ; hair on back 35 mm. long, with no outstanding longer hairs with special colour zones. General colour uniform orange rufous, this colour extending on top and sides of head to region of orbits, also on sides of limbs, but distinctly lighter on ventral surfaces and base of tail, merging into brown on forepaws ;

37. Black-striped Wallaby (*Macropus dorsalis*), Female

38. Parry's Wallaby (*Macropus parryi*), Mother and Young

Photo A. Enor

39. Black-gloved Wallaby (*Macropus irma*)

40. Agile Wallaby (*Macropus agilis*). Female, with Tail of Young protruding from Pouch

bases of hairs buff-coloured throughout; top of muzzle grizzled, with exception of darker area below eye, which merges toward nasals into grizzled appearance of muzzle. No face-markings; no indication of white whisker-stripe. Rhinarium large, naked, wide superior border being almost straight. Ears oval, thickly clothed externally with orange-rufous hairs, almost naked internally, except for strong lateral tufts and few scattered hairs. Size as in *M. ualabatus*; ear, 80 mm.

BLACK-STRIPED WALLABY

Macropus dorsalis, Gray. Eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 37.

Rhinarium wholly naked. General colour grey; rufous on forequarters and back of neck; distinct narrow black line from occiput down centre of back; under fur grey brown; general colour of face grey, face-markings very indistinct; white spot at base of outer edge of ear; back of ears rufous, darkening at tips; distinct white hip-stripe present; arms rufous; legs grey; fingers and toes becoming black; under parts white; tail black at tip. Head and body, 660–790 mm.; tail, 510–610 mm.; hind-foot, 170–175 mm.; ear, 63 mm. (See Fig. 37.)

PARRY'S WALLABY

Macropus parryi, Bennett. Highlands of Northern New South Wales and Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 39.

Form slender, graceful, with very long tail and conspicuous face-markings. Fur soft, almost woolly. Colour variable; in winter clear grey, with blue tinge, which becomes suffused with yellowish brown in summer; this is more pronounced in specimens from Atherton district, Queensland. Top of muzzle brown, slightly paler than two whisker-marks; cheek-stripes white, sharply defined; grey band passing backward from angle of mouth between cheek-stripe and white chin; crown of head grey, becoming whiter between ears, white passing backward as nuchal stripe to about half-way down neck, with darker mark on each side of it; ears brown at base and tip, with white band between; sides of rump lighter; under surface pure white; hands and feet becoming black on digits; tail pale grey, with a crest of black or grey hairs at tip. Head and body, 800 mm.; tail, 740 mm.; hind-foot, 237 mm.; ear, 78 mm. (See Fig. 38.)

BLACK-GLOVED WALLABY

Macropus irma, Jourdan. South-west Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 40.

Nose partly hairy between nostrils. Hair thick, soft. General colour above dark bluish grey, sometimes with brownish tinge owing to rufous under fur showing through longer hair; cheek-stripe yellowish, sharply defined, continuous, with prominent white blotch at base of outer margin of ear; dark band passing backward from angle of mouth between this stripe and white chin; back of ears and crown of head black, black passing backward as dark nuchal stripe; inside of ears pale yellow, except at tip, where there is prominent black border or rufous tinge; hands to metacarpus and front of legs, and feet to ends of metatarsus, yellow; fingers and toes sharply defined black; tail grey proximally and on sides, well-defined crest of long stiff black hairs on both upper and lower sides of distal three-quarters, tip sometimes white. Head and body, 780 mm.; tail, 720 mm.; hind-foot, 195 mm.; ear, 65 mm. (See Fig. 39.)

AGILE WALLABY

Macropus agilis, Gould. Northern Australia, some islands off coast, and Papua. *Cat. Mars. and Monot. Brit. Mus.*, p. 42.

Nose partially hairy between nostrils. Fur short, coarse. General colour above dark grizzled sandy; under fur almost absent; faint brown whisker-mark reaching half-way from eye to nose, passing into whitish cheek-stripe, which is separated from white chin by band of sandy grey; top of head sandy brown, which becomes darker between ears and passes down neck as ill-defined dark nuchal line; ears short, with interior and bases white or yellowish, and backs dark sandy, tipped and edged anteriorly with black; well-marked hip-stripe separated from paler flanks by triangular portion of dark sandy colour continuous with that of back; under surface whitish or yellowish white; hands and feet greyish white, sometimes becoming dark on digits; tail with proximal third sandy and distal part whitish, with few dark hairs at tip. Head and body, 765 mm.; tail, 580–850 mm.; hind-foot, 179–234 mm.; ear, 57–64 mm. (See Fig. 40.)

Group 3. *Small Wallabies*

The smaller wallabies, which form a fairly well-defined group, are each about the size of a hare. The muzzle is naked generally, with an upward extension, the hair growing downward on each side of it. The foramina in front of the palate are very small, while the vacuities in the posterior part are large, being usually separated by a mere bar of bone. The outer incisor tooth is relatively small, and carries a well-marked notch, which is generally situated in the posterior end of the crown.

The particular habitat of the members of this group is among thick scrub, or under the tangle of long grass and ferns that grow in swampy lands, or in the under scrub of heavy forests. Practically the only way to see some of them is to wait on the edge of the thickets in the evening, when they come out to feed, but they can be trapped, snared, or driven into nets placed in their runways. The fur is fine and soft, and great numbers are used for rugs, coats, and trimmings. We have practically no knowledge as to the individual life-histories of this group.

As a group they are tame and inoffensive. When disturbed in the bush they allow a close approach, being rather more curious to find out who or what the visitor is than to take flight. We have noted *M. wilcoxi* in the forests of the Bunya Mountains, in Queensland; it seems to have weak sight, and was quite unconcerned at our presence. It moved off with a light, fairly fast gait, and did not seem to have any special track through the undergrowth as the larger wallabies have. *M. thetidis* has been noted in the scrub on the Blue Mountains, New South Wales. It was very difficult to see, and impossible to follow in the dense bush. It was seen feeding quietly in the open glades in the evening, and showed the characteristics of the family in not being very wary. *M. billardieri* has been met with in Gippsland (Victoria) and in Tasmania. It was very difficult to pick out in the dark forest, with which its dull coloration blended. It depended more on sound signals than on sight and smell for its safety. On hearing anything approaching it would knock twice on the ground, "Thump! Thump!" If there was no answering signal it would make off, but if the observer also thumped, and was not too conspicuous, it would wait until he was within a few yards of it.

CAPE YORK WALLABY

Macropus coxeni, Gray. North Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 44.

Rhinarium with hair bordering it above forming two paired projections downward instead of single median one. Fur short, close, coarse; under fur almost or quite absent. General colour above dark grizzled sandy; under surface white; dull rufous on crown and round bases of ears; faint white cheek-stripe present; back of ears, occiput, back of neck, withers, and patch behind forearm dark brown, contrasting with general sandy colour; white stripe on hips; arms and legs sandy; tips of toes brown; tail black above and white below and at tip. Head and body, 700 mm.; tail, 360 mm.; hind-foot, 132 mm.; ear, 53 mm.

BANDED WALLABY

Macropus stigmaticus, Gould. North-east Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 47.

Rhinarium with upper border forming two paired convexities as in *M. coxeni*, lower part continued to lip. Fur short, close, rather coarse; under fur thin, dark slaty grey. General colour above rufous grey, grey predominating on nape and forequarters, rufous on lower back; under surface white; muzzle grey; crown, cheeks, region round notch of ears deep rust colour; few hairs round notch of latter pale yellow; indistinct pale cheek-stripe, with rufous line behind it, running from lower lip to beneath eye; back of ears, nape, occiput brown, with indistinct darker nuchal stripe; sides of body rich rufous; two longitudinal bright rusty bands border white of belly; prominent yellowish hip-stripe; sides of rump deep rufous, gradually passing into bright rust colour on back and outside of the lower legs; arms rufous; hands and feet grey or rufous grey; tips of toes brown; tail uniform grey brown above, whitish below. Head and body, 700 mm.; tail, 380 mm.; hind-foot, 129 mm.; ear, 50 mm.

RED-LEGGED WALLABY

Macropus wilcoxi, McCoy. South-eastern Queensland and New South Wales. *Cat. Mars. and Monot. Brit. Mus.*, p. 48.

Like the banded wallaby (of which it is probably a subspecies), but fur longer and softer, colours less brilliant, hip-stripe obsolete. General colour above brownish; under parts white, tinged with grey; fore-part of face grey; ill-defined patch above each eye; base of ears deep rust colour, base of ear outside also rusty; flanks grey, tinged rufous; arms, hands, feet greyish or pale rufous; outside of hind-limbs often bright rufous; tail grey above, white below. Head and body, 530–610 mm.; tail, 300–345 mm.; hind-foot, 116–138 mm.; ear, 46–48 mm. (See Fig. 41.)

ARU ISLAND WALLABY

Macropus brunii, Schreb. Aru and Kei Islands. *Cat. Mars. and Monot. Brit. Mus.*, p. 49.

Upper border of rhinarium with only single central prominence downward. Fur short, close, straight; under fur almost entirely absent. General colour above uniform chocolate brown, becoming finely grizzled grey on lower rump and hips; well-marked hip-stripe; head brown, with white whisker-mark from mouth to beneath eye; back of ears black, crown between ears sometimes black; under surface white, faintly tinged brown; extremities grey or brown, more or less grizzled white. Head and body, 550–770 mm.; tail, 305–334 mm.; hind-foot, 115–130 mm.; ear, 43–45 mm.

SOMBRE WALLABY

Macropus browni, Ramsay. Eastern and South-eastern New Guinea and New Britain group. *Cat. Mars. and Monot. Brit. Mus.*, p. 51.

Similar to *M. brunii* in all characters, but fur thicker, softer, with general colour greyer and more distinctly grizzled. Ears brown like head behind; belly yellow; hip-stripe almost absent. Head and body, 540 mm.; tail, 340 mm.; hind-foot, 117 mm.; ear, 42 mm.

PADEMELON WALLABY

Macropus thetidis, Lesson. South-eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 52.

Rhinarium broad to lip; latter but little developed, not hiding front teeth. Fur thick, soft, its direction on nape variable. General colour above grizzled grey, with rufous neck; rufous of forequarters gradually passing into deep grizzled grey of back; faint hip-stripe may be present; under surface white; head evenly coloured, at times rufous on cheeks and round base of ears; ears long, their backs grey, edged anteriorly black or brown; arms and legs grey or rufous; hands and feet pale brown; tail brown basally, then brown above and white below. Head and body, 540–620 mm.; tail, 380–395 mm.; hind-foot, 118–131 mm.; ear, 51–57 mm. (See Fig. 42.)

41. Red-legged Wallaby (*Macropus wilcoxi*)

42. PADEMELON WALLABY (*Macropus thetidis*), MALE

43. DAMA WALLABY (*Macropus eugenii*), FEMALE

DAMA WALLABY

Macropus eugenii, Peron and Lesueur. South-western Australia and islands off coast. *Cat. Mars. and Monot. Brit. Mus.*, p. 55.

Character and size variable. Rhinarium ending some way from mouth, opening at top of distinct cleft running down to upper lip. Fur rather short in mainland and longer in island specimens; under fur thick, soft, slaty grey. General colour above grizzled grey, with rufous shoulders; more or less rufous on flanks and lower back in summer, and grey in winter; ill-defined brown band running down between ears to back generally present; under surface whitish or greyish white; extremities grey, becoming black distally. Ears long in mainland, short in island forms, uniform dark grey, brown behind. Head and body, 540–700 mm.; tail, 330–420 mm.; hind-foot, 124–144 mm.; ear, 44–63 mm. (See Fig. 43.)

BEDFORD'S WALLABY

Macropus bedfordi, Thomas. North Queensland. *Proc. Zool. Soc.*, 1900, p. 112.

Fur long, thick, woolly. General colour pale isabelline fawn; hairs slate grey at base, then brown, with white subterminal band and pale brown tip; slightly darker between ears and down neck; face-marks faint; back of ears terminally sandy fawn, basally and a patch below bases externally dull white; chin and throat dull white; chest and belly whitish fawn; inguinal region, front of hips, and line down front of lower leg white; indistinct darker elbow-mark; hands whitish brown; legs sandy brown behind and laterally; upper surface of feet sandy white, darkening terminally; long hairs at base of claws clear sandy white. Tail short and thick, sandy fawn above and on both sides, whitish below. Head and body, 550 mm.; tail, 360 mm.; hind-foot, 115 mm.; ear from notch, 52 mm.

PARMA WALLABY

Macropus parma, Waterhouse. South-eastern New South Wales. *Cat. Mars. and Monot. Brit. Mus.*, p. 57.

Similar to *M. eugenii*, but whole back more evenly mixed with rufous, nape and forequarters not contrasting with centre of back; white cheek-stripe and brown nuchal stripe both more clearly defined, latter somewhat narrower; front of throat pure white, sharply contrasting with side of neck; belly greyish white. Ears short, their backs rufous grey. Head and body, 590–640 mm.; tail, 410 mm.; hind-foot, 125–136 mm.; ear, 47–54 mm.

RUFOUS-BELLIED WALLABY

Macropus billardieri, Desmarest. South-eastern Australia and Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 58.

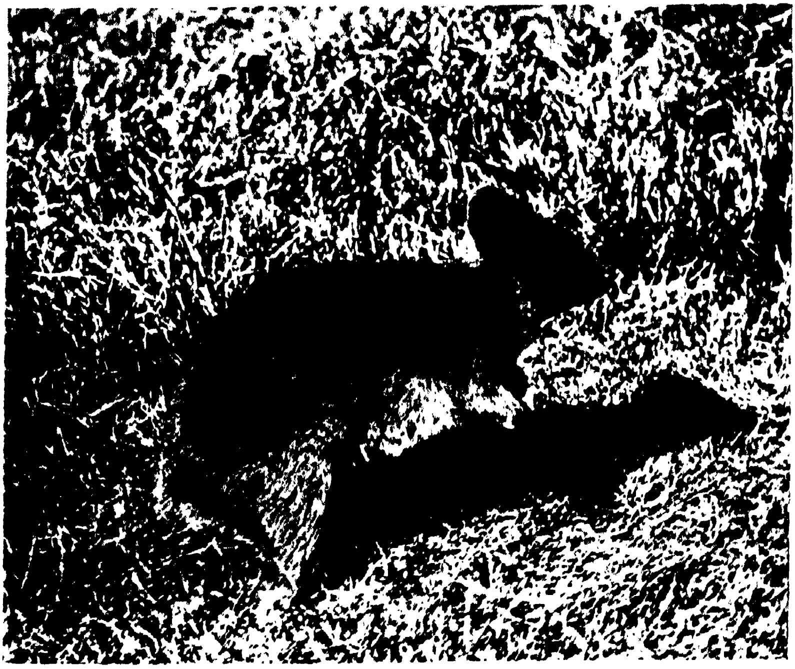
Form stout. Hair long, thick, soft; under fur long, soft, slaty grey. General colour above uniform greyish brown, with olive tinge, especially on head and rump; nape and forequarters usually dull greyish brown, sometimes with tinge of rufous; indistinct nuchal stripe sometimes present; back and sides coarsely grizzled grey and black; faint yellowish hip-stripe may be present; under surface orange or rufous. Tail very short, greyish brown, above orange proximally, below greyish white distally. Head and body, 650–660 mm.; tail, 360 mm.; hind-foot, 130–135 mm.; ear, 46–57 mm. (See Fig. 44.)

SHORT-TAILED WALLABY

Macropus brachyurus, Quoy and Gaimard. South-western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 60.

Form short and squat. Fur long, thick, coarse; under fur long, thick, slaty grey. General colour above uniform coarsely grizzled grey-brown, with tinge of rufous in some specimens; under surface slaty grey; face without definite markings; sides of cheeks pale grey or rufous. Ears very short, rounded, projecting but little beyond fur. Head and body, 580 mm.; tail, 250 mm.; hind-foot, 105 mm.; ear, 42 mm. (See Fig. 45.)

44. Rufous-bellied Wallaby (*Macropus billardieri*)



45. Short-tailed Wallaby (*Macropus brachyurus*)

46. Yellow[illegible]ed Rock-wallaby (*Petrogale xanthopus*)

47. Brush-tailed Rock-wallaby (*Petrogale penicillata*)

Rock-wallabies

Genus Petrogale, Gray

The special characters of the rock-wallabies are that the nose is naked, the fur on the back of the neck directed downward, the central hind-claw very short, and the tail long, and of the same thickness all the way down, instead of tapering as in the wallabies that live in the forest. As is indicated by their name, rock-wallabies are found in the rocky ranges all over Australia, in the same localities as the wallaroos. Like the latter, they are not found in Tasmania or New Guinea.

These animals spend the day in a cave, under projecting rocks, or in hollow logs. If their haunts are invaded one may often hear a "Thump! Thump!" on the ground, a note of inquiry made by the wallaby. If there is no answering thump it is on the *qui vive*, ready to retreat. If in a cave where it cannot see the disturber it allows a close approach, and so can easily be shot or even taken by hand. Owing to this fact, and to the depredations of the fox, the eastern species (the brush-tailed rock-wallaby) is now scarce where it was once very numerous. Sometimes a 'rocky,' as it is often called, will trust to its colour protection to escape observation, and remain perfectly still on a high ledge; then one may see the little sprite-like face gazing intently, but at the least demonstration it is gone in a flash. It is useless to follow, for the animal has its own road over the rough terrain, which will lead to some secure retreat. These paths are easy to find, for in places the rocks will be worn quite smooth, polished by generations of feet passing over them.

The agility of the rock-wallaby in its natural haunts is positively astonishing. No living creature could be more accurate in its judgment, and no other animal would dare perform such rapid 'stunts' without bringing the fore-limbs occasionally into action. Leaning trees are easily scaled. When hotly pursued the rock-wallaby will make for the tree at top speed, and without hesitation spring as high as possible up the trunk, then finally gain a fork or large limb and sit tight, perched at right angles to the bough, gripping only with the padded soles of the feet, the toe following the contour of the branch, while the tail hangs down as a balance. Thus it almost emulates the tree-kangaroo.

For all their activity, however, the rock-wallabies fall victims to very sluggish enemies, for invariably the wallaby rocks are inhabited by large carpet-snakes (*Python varius*), which generally lie in wait for their victims in the caves in which they take shelter. As indicated, unless thoroughly alarmed the wallabies' sense of life-preservation is not high. The males, however, are extremely pugnacious.

There are several well-marked species, and, as is usual, the types inhabiting the drier regions are more brightly coloured than those found in the coastal country. This is especially marked in the yellow-footed rock-wallaby, which is one of the handsomest of the marsupials. Here grey, brown, and yellow harmonize well with the brilliantly lighted bare rocks among which the animal dwells. It is wonderfully active, and can face a cliff that is almost perpendicular.

The grey rock-wallaby has a wide distribution in the centre, west, and south-west of the continent, and is also found on some islands off the southern coast. Spencer found it on some of the desert sandstone ranges, more especially on the George Gill, Levi, James, and Macdonnell ranges, in Central Australia. He remarks that it is very shy, and remarkably agile among the rocks.

The reddish rock-wallaby lives in caves in the ironstone ranges of mid-North-west Australia, with which its colour in every way harmonizes. When members of this species are disturbed they make a drumming noise with their feet, evidently a danger signal. They lie up during the heat of the day, but come out in the late afternoon to sit on a bare rock, apparently enjoying a sun-bath. Their usual food is grass, but, like all the rock-wallabies, they can live on the bark of trees and roots in dry times; this food enables them to do without water for a long period.

Key to Species of Petrogale

A. Tail ringed or blotched. Dark nuchal stripe present	
White hip-patch present	*P. xanthopus*
White hip-patch absent	*P. celeris*
B. Tail not ringed or blotched; darker toward tip	
b. Black occipital stripe extending down neck	
Tail nearly all black. Head and body, 720 mm.	*P. penicillata*
Head and body, 510 mm.	*P. assimilis*
Tail with terminal third drabby whitish	
Head and body, 465 mm.	*P. godmani*
b^1. Black occipital stripe passing down back	
Tail about half black. Head and body, 590–600 mm.	*P. lateralis*
Head and body, 660 mm.	*P. hacketti*
Head and body, 500 mm.	*P. pearsoni*
b^2. Black occipital or nuchal stripe absent	
Back of ears uniform grey or fawn	*P. brachyotis*
Back of ears uniform dark brown	*P. rothschildi*
Back of ears particoloured	*P. purpureicollis*
b^3. No body-markings. General colour sandy grey	*P. inornata*

YELLOW-FOOTED ROCK-WALLABY

Petrogale xanthopus, Gray. Inland, from South Australia to Western Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 64.

Fur long, soft, silky. General colour of back grey; under fur thick, close, dark grey; well-defined streak running from between ears to middle of back; triangular brown blotch behind elbow, followed by white lateral streak, which runs down body to hip; top of knee with another brown mark, outside of which is prominent white patch; under surface pure white; face and crown grey, with tinge of yellowish; well-defined white cheek-stripe from mouth, below eye, to ear; rich orange spot above each eye; ears long, their backs uniform dark yellow, inner sides edged with white, except at tips, which are yellow; arms, hands, legs, and feet rich yellow;

tips of toes and fingers brown; tail ringed above with alternate bands of brown and yellow, well-marked blackish crest on uppermost side, under side yellowish, tip may be yellowish. Head and body, 680–800 mm.; tail, 600 mm.; hind-foot, 160–170 mm.; ear, 70–74 mm. (See Fig. 46.)

ACTIVE ROCK-WALLABY

Petrogale celeris, Le Souef. South-west Queensland. *Aust. Zool.*, iii, 7, 1924, p. 273.

General colour of the back wood brown tinged with grey, the grey predominating on the nape and between the shoulders; brown colour darker down centre of back; a well-defined blackish streak runs from the crown down the upper back, becoming ill defined on the rump, but showing distinctly through the reddish-cinnamon patch of the tail base, thence continuing along the tail to its tip; fore-part of shoulders and front and inner side of arm to wrist pinkish cinnamon; fore-part of thigh and over knee to ankle cinnamon; hind-part of shoulders and forearm, and inner part of upper thigh, bistre; a narrow white or buffy-white lateral stripe runs from withers to hip, and is separated by a dark line from the buffy-white under surface; there is a conspicuous patch of reddish cinnamon at the base of the tail, which is more pronounced than a somewhat similar patch in *P. xanthopus*; face varying shades of grey, suffused with tinges of cinnamon, a well-defined whitish cheek-stripe present; back of ear uniform sayal brown, inner sides edged with white for basal half; a sayal-brown spot above eye; forearm blackish brown; hind-foot light tawny olive, becoming dark brown on toes, with black hairs covering tip of longest toes. Tail short-haired; in female the dark brown line along top is widened into blotches at regular intervals, which are faintly extended laterally, the intervening colour being greyish buffy brown; in male the dark tail-stripe is very ill defined, and correspondingly the blotches are but faintly indicated, the annulations barely discernible, except for a few inches at the tail tip. Female (flat skin): head and body, 600 mm.; tail, 565 mm.; hind-foot, 158 mm.

Brush-tailed Rock-wallaby

Petrogale penicillata, Gray. Ranges of Eastern Australia, north to Rockhampton. *Cat. Mars. and Monot. Brit. Mus.*, p. 66.

Fur long, thick. General colour above dull grey brown; hairs tipped white on forequarters, gradually becoming deep rufous on rump and base of tail; black mark behind shoulder succeeded by grey one, though both are inconspicuous in summer; chin and chest pale grey; belly sometimes tinged yellow; anal region yellowish rufous; face dark grey brown, ill-defined whisker-mark and light cheek-stripe; crown grey, black line from its centre to occiput; ears short, their insides and posterior edges outside yellow, rest of their backs grey at base, black terminally; arms and legs brown or rufous brown; fingers and toes black; tail more or less bushy, basal part rufous, remainder black, tip may be yellow. Head and body, 720 mm.; tail, 560 mm.; hind-foot, 154–164 mm.; ears, 48–51 mm. (See Fig. 47.)

Allied Rock-wallaby

Petrogale assimilis, Ramsay. North-east Queensland. *Proc. Linn. Soc. New South Wales*, i, 1877, p. 360.

Fur thick, closely set, medium length. General colour above dark ashy grey, mingled with a few rusty hairs on the rump and hinder part of thighs; sides lighter, under surface inclining to light ashy grey; lips, chin, and chest ashy white; tail black, hairs harsh, a little longer at tip, where they form an inconspicuous tuft, base of tail rusty colour; hind-feet brownish, becoming blackish on toes; forelegs greyish, inclining to rusty in front, dark chocolate brown on inner sides; hands dark chocolate brown; head greyish brown, cheek-mark faint; on margin, inner part, and apex of ears light cream; ears externally dark brown. Hairs radiating from ears directed forward and downward toward cheeks. Dark line on crown; dark mark under forearm. Head and body, 510 mm.; tail, 405 mm.; hind-foot, 130 mm.; ear, 50 mm.

tips of toes and fingers brown; tail ringed above with alternate bands of brown and yellow, well-marked blackish crest on uppermost side, under side yellowish, tip may be yellowish. Head and body, 680–800 mm.; tail, 600 mm.; hind-foot, 160–170 mm.; ear, 70–74 mm. (See Fig. 46.)

ACTIVE ROCK-WALLABY

Petrogale celeris, Le Souef. South-west Queensland. *Aust. Zool.*, iii, 7, 1924, p. 273.

General colour of the back wood brown tinged with grey, the grey predominating on the nape and between the shoulders; brown colour darker down centre of back; a well-defined blackish streak runs from the crown down the upper back, becoming ill defined on the rump, but showing distinctly through the reddish-cinnamon patch of the tail base, thence continuing along the tail to its tip; fore-part of shoulders and front and inner side of arm to wrist pinkish cinnamon; fore-part of thigh and over knee to ankle cinnamon; hind-part of shoulders and forearm, and inner part of upper thigh, bistre; a narrow white or buffy-white lateral stripe runs from withers to hip, and is separated by a dark line from the buffy-white under surface; there is a conspicuous patch of reddish cinnamon at the base of the tail, which is more pronounced than a somewhat similar patch in *P. xanthopus*; face varying shades of grey, suffused with tinges of cinnamon, a well-defined whitish cheek-stripe present; back of ear uniform sayal brown, inner sides edged with white for basal half; a sayal-brown spot above eye; forearm blackish brown; hind-foot light tawny olive, becoming dark brown on toes, with black hairs covering tip of longest toes. Tail short-haired; in female the dark brown line along top is widened into blotches at regular intervals, which are faintly extended laterally, the intervening colour being greyish buffy brown; in male the dark tail-stripe is very ill defined, and correspondingly the blotches are but faintly indicated, the annulations barely discernible, except for a few inches at the tail tip. Female (flat skin): head and body, 600 mm.; tail, 565 mm.; hind-foot, 158 mm.

BRUSH-TAILED ROCK-WALLABY

Petrogale penicillata, Gray. Ranges of Eastern Australia, north to Rockhampton. *Cat. Mars. and Monot. Brit. Mus.*, p. 66.

Fur long, thick. General colour above dull grey brown; hairs tipped white on forequarters, gradually becoming deep rufous on rump and base of tail; black mark behind shoulder succeeded by grey one, though both are inconspicuous in summer; chin and chest pale grey; belly sometimes tinged yellow; anal region yellowish rufous; face dark grey brown, ill-defined whisker-mark and light cheek-stripe; crown grey, black line from its centre to occiput; ears short, their insides and posterior edges outside yellow, rest of their backs grey at base, black terminally; arms and legs brown or rufous brown; fingers and toes black; tail more or less bushy, basal part rufous, remainder black, tip may be yellow. Head and body, 720 mm.; tail, 560 mm.; hind-foot, 154–164 mm.; ears, 48–51 mm. (See Fig. 47.)

ALLIED ROCK-WALLABY

Petrogale assimilis, Ramsay. North-east Queensland. *Proc. Linn. Soc. New South Wales*, i, 1877, p. 360.

Fur thick, closely set, medium length. General colour above dark ashy grey, mingled with a few rusty hairs on the rump and hinder part of thighs; sides lighter, under surface inclining to light ashy grey; lips, chin, and chest ashy white; tail black, hairs harsh, a little longer at tip, where they form an inconspicuous tuft, base of tail rusty colour; hind-feet brownish, becoming blackish on toes; forelegs greyish, inclining to rusty in front, dark chocolate brown on inner sides; hands dark chocolate brown; head greyish brown, cheek-mark faint; on margin, inner part, and apex of ears light cream; ears externally dark brown. Hairs radiating from ears directed forward and downward toward cheeks. Dark line on crown; dark mark under forearm. Head and body, 510 mm.; tail, 405 mm.; hind-foot, 130 mm.; ear, 50 mm.

LIGHT-TAILED ROCK-WALLABY

Petrogale godmani, Thomas. North Queensland. *Proc. Zool. Soc.*, 1923, p. 177.

General characters as in *P. assimilis*. Black axillary patch less extensive; forearm patch more strongly buffy; tail instead of being black for its terminal third or half is drabby whitish to the end. Head and body, 465 mm.; tail, 502 mm.; hind-foot, 144 mm.; ear, 59 mm.

SIDE-STRIPED ROCK-WALLABY

Petrogale lateralis, Gould. Central and Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 68.

Fur long, soft, close, rather woolly. Back grey, with faint rusty tinge; prominent black or brown mark just behind elbow, succeeded by well-defined white stripe running down to hip; front of knee brown, connected by brown band with dark shoulder-spot; under surface yellowish grey; sides of chest and inner sides of arm brown; arms, legs, feet grey; face grey, with well-defined whisker-mark, whitish or yellowish cheek-stripe; crown dark grey; between ears commences narrow black or brown line, which runs down nape and disappears about centre of back; ears inside and at base yellow, terminal half outside brown, tip yellow; tail grey proximally, black terminally. Head and body, 590–600 mm.; tail, 420–460 mm.; hind-foot, 120–139 mm.; ear, 48–49 mm.

MONDRAIN ISLAND ROCK-WALLABY

Petrogale hacketti, Thomas. Mondrain Island, South-west Australia. *Ann. Mag. Nat. Hist.*, (7) xvi, 1905, p. 425.

Similar to *P. lateralis*, but larger, and with larger teeth, especially the anterior premolar. Head and body, 600 mm.; tail, 540 mm.; hind-foot, 139 mm.; ear, 55 mm.

PEARSON'S ISLAND ROCK-WALLABY

Petrogale pearsoni, Thomas. Pearson's Island, off South Australia. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 681.

Closely resembles *P. lateralis*; dark lateral lines more blackish and white patch at base of ears larger. Tail with upper surface about 3 inches from base contrasted black; sides dull buffy whitish; above black fades off into terminal buff, but below it continues to within 2 inches of tip. Head and body, 500 mm.; hind-foot, 136 mm.; ear, 43 mm.

SHORT-EARED ROCK-WALLABY

Petrogale brachyotis, Gould. North-west Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 69.

Fur short, thin; under fur coarse, dark slaty grey. General colour greyish fawn; dark blotch behind elbow, succeeded by whitish band; under surface greyish white; head pale grey; face-markings faint; ears very short, their backs uniform and extreme tips white. Head and body, 540 mm.; tail, 90 mm.; hind-foot, 130 mm.; ear, 40 mm.

REDDISH ROCK-WALLABY

Petrogale rothschildi, Thomas. Mid-North-west Australia. *Nov. Zool.*, xi, 1904, p. 366.

Fur rather short, thin; fur of nape reversed forward from withers. General colour of back dull vinaceous brown, lightening to brownish or purplish on nape; no dark occipital or nuchal stripe; head dark brown; ill-defined blackish streak running from muzzle through eye to base of ears, which are wholly dark brown outside and in; shoulders with trace of white patch behind; throat whitish; under surface dull brownish, area round pouch buffy; tail not very bushy, basal half greyish brown, distal half covered with mixed black and white hairs; arms and legs greyish brown, becoming slightly rufous on hands and black on ends of toes. Head and body, 560 mm.; tail, 450 mm.; hind-foot, 130 mm.; ear, 52 mm.

PURPLE-NECKED ROCK-WALLABY

Petrogale purpureicollis, Le Souef. Dajarra, North-west Queensland. *Aust. Zool.*, iii, 7, 1924, p. 274.

Fur short and very soft. General colour above light drab grey, irregularly marked with black or brown, interspersed with fleckings of a shade of buff, the colours tending to form short lines; under surface a lighter buffy grey; hair on back of neck radiating laterally from centre, and washed with brownish vinaceous (colour pinkish purple in live animal, but soon fades), fading into a lighter wash on cheeks and throat; a dark brown mark commences before and extends over eye to ear base; nose from tip to front of eye darker than rest of head, a paler patch under eye, but not forming a cheek-stripe; ears particoloured behind, upper fore-part of outside dark mummy brown, lower fore-part and entire posterior half of outside lighter brownish buff; sides lighter, but no lateral stripe present; edging the back of the shoulder and extending on to the side is a strongly defined patch of blackish brown; the outer edge of this patch is dark tawny brown, which colour extends down back of arm; front of arm cinnamon buff, suffused with tawny olive; paws sayal brown, outer digits blackish brown, which gives way to rich dark brown on the inner ones; a prominent blackish-brown streak commences a little below or on the knee, and extends over the knee and up the sides half-way to wither; front of legs tinged with buffy grey; foot light ochreous buff near ankle, pencilled with brown, which is darker along centre of foot, grading into blackish brown on a level with toes. Tail short-haired to about its terminal fourth, upon which the hairs gradually lengthen, forming a slight tuft at tip; general colour of proximal two-thirds tawny olive, pencilled with grey, buff, and brown, the terminal third gradually darkening from blackish brown to black at tip. Male (flat skin): head and body, 670 mm.; tail, 510 mm.; hind-foot, 150 mm.; ear, 50 mm.

PLAIN-COLOURED ROCK-WALLABY

Petrogale inornata, Gould. Northern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 70.

General colour above sandy grey, grizzled over shoulders and becoming lighter on flanks; indistinct light line running along face under eye; ears sandy grey, bordered by narrow line of dark brown on inner edge; dark patch on occiput, passing into line down forehead; dusky red patch behind elbow; under surface sandy white, inclining to rufous on lower part of abdomen; arms and tarsi sandy grey, passing into dark brown on tips of fingers; basal half of toes sandy brown, remainder black, former colour extending along sides of tail for some distance toward tip. Head and body, 580 mm.; tail, 390 mm.; hind-foot, including claw, 133 mm.; ear, 47 mm.

LITTLE ROCK-WALLABY

Genus Peradorcas, Thomas

The little rock-wallaby is very similar to the ordinary type in its external characters, but on account of its carrying an extra number of molar teeth, seven at least, it has been put into another genus. In this genus we have one species and one sub-species. This animal lives chiefly in the scrubby lands of the hills, and consequently is rather hard to see unless the aid of a dog is secured to drive it into the open. Owing to the wild, uninhabited nature of the country that the *Peradorcas* inhabits, we do not know much about its habits; few naturalists have seen it.

LITTLE ROCK-WALLABY

Peradorcas concinna concinna, Gould. North-western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 71; *Proc. Zool. Soc.*, 1897, p. 317.

Fur short, soft, silky; under fur thick, long, soft, slate colour at base, rufous fawn at tip. General colour above rich orange white, with few longer black and white hairs; under surface greyish white; head pale fawn; face-markings faint; body without markings, except faint trace of dark patch behind elbow; arms, legs, feet greyish fawn; tail becoming darker toward tip, with yellowish-brown terminal pencil. Head and body, 350 mm.; tail, 300 mm.; hind-foot, 94 mm.; ear, 27 mm.

Peradorcas concinna canescens, Thomas. Arnhem Land, North Australia. *Ann. Mag. Nat. Hist.*, (8) iv, 1909, p. 198.

General colour grizzled grey; dull rufous under fur heavily overlaid by longer hairs with broad sub-terminal grey bands and black tips; crown greyish; brown mark behind shoulder succeeded by lighter one; light hip-mark present. Head and body, 400 mm.; tail, 325 mm.; hind-foot, 101 mm.; ear, 41 mm.

NAIL-TAILED WALLABIES

Genus Onychogale, Gray

The nail-tailed wallabies are distinguished by a small horny projection at the end of the tail, and they are prettily marked on the face and shoulders, a decoration that has given them the name of bridled wallabies. There are three species, coloured according to environment.

The bridled nail-tailed wallaby, found in Eastern Australia, inhabits the foothills and low ranges; it particularly favours the pine-forests and the area covered with long rough grasses, the grey-green shade of which agrees well with the clear grey coloration of the animal. During the daytime this species will lie up in a ‘ form ’ under a tussock of grass, generally well covered from observation. Occasionally one will be a little careless in this respect, and will be picked up by the great wedge-tailed eagle. Remains of the animal have been found in this bird’s aerie. On being disturbed the wallaby dashes away, and is quickly lost in the undergrowth.

This species, like so many other animals found in the more closely settled parts of Eastern Australia, is now becoming very scarce, and will probably soon be extinct. With the occupation of the land by sheep and cattle, and the competition of the rabbit, the food and shelter to which the wallabies were accustomed are decreasing. At the same time, their enemies are increasing as their possible living-grounds are becoming more and more restricted. But it is the imported fox that is making the wholesale clearance, threatening early extinction. It is a pity that this wallaby apparently cannot live in the coastal regions, where small ticks keep the fox at bay.

When running the bridle-tail holds the arms at right angles to the body, giving the impression that it is injured. When a female is disturbed with a young one in her pouch she runs to the nearest hollow log, drops the 'joey,' and makes off again. The young one scrambles into the hollow, and if the mother survives it is picked up later; the old animals too will often take shelter in such a refuge.

The fawn-coloured nail-tailed wallaby inhabits the drier parts of Northern Australia, where the land is largely unoccupied. It remains to be seen if Reynard can establish himself in this hot area and kill out the native game. This wallaby, often in conjunction with the agile wallaby, inhabits the grassy plains alternating with scrub. Nail-tails lie up during the day in dense thickets, and feed at night in the cleared spaces, principally eating the roots of certain species of coarse grasses. They seem to be independent of water. On being disturbed they do not, like the other wallabies, give a warning thump on the ground, but they generally emit a grunt before starting off.

Mr G. S. Shortridge found the crescent nail-tailed wallaby very local, living in low scrubby thickets. When disturbed it often ran into hollow logs.

Key to Species of Onychogale

A. General colour fawn. Tail long; terminal nail large and flattened . . . . . *O. unguifera*

B. General colour grey. Tail medium; terminal nail small, rounded

White shoulder-stripe running forward along back of neck; centre of neck black or grey *O. frenatu*
White shoulder-stripe ending above shoulders; neck dark rufous . . . . . *O. lunata*

Fawn Nail-tailed Wallaby

Onychogale unguifera, Gould. North-western and Northern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 74.

General colour uniform sandy fawn; central darker stripe on neck, back, and rump; indistinct white mark behind elbow; white hip-stripe present; under surface white, bases of hairs slaty grey; face and head pale fawn, indistinct white cheek-stripe; ears thinly covered with white hairs; arms, hands, feet, front of legs white, back of legs fawn; tail white above, sandy below, terminal third having indistinct rings, which coalesce into black tip, hairs forming crest on upper side and pencil at end. Terminal nail large, flattened laterally, from 10 to 15 mm. long. Head and body, 660 mm.; tail, 665 mm.; hind-foot, 174 mm.; ear, 61 mm.

Bridled Nail-tailed Wallaby

Onychogale frenata, Gould. Eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 75.

Fur soft, thick; under fur slate colour, with grey tip. General colour above clear grey, with conspicuous white side-stripe on forequarters; centre of back of neck black, which merges in middle line into dark grey of back, the black edged on each side with continuation of white shoulder-stripe, which, starting from light belly colour about inch behind the elbow, runs upward and forward along side of back of neck to just behind ears; black sometimes continued faintly along middle line of head; sides of neck with rufous tinge; hip-stripe present; chin and chest white; belly pale grey; ears outside greyish brown; fingers black; front of legs and feet white; tip of tail black. Terminal nail very short. Head and body, 460–650 mm.; tail, 380–450 mm.; hind-foot, 120–152 mm.; ear, 60–62 mm. (See Fig. 48.)

CRESCENT NAIL-TAILED WALLABY

Onychogale lunata, Gould. South-west and Central Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 77.

Fur soft, woolly ; under fur long, slaty grey at base, pale grey terminally. General colour above dark grey ; back and sides of neck rich rufous ; conspicuous white shoulder-stripe running forward from white of belly and ending over scapula ; whitish stripe just above hip, and another parallel to it in usual position of hip-stripe ; under parts whitish ; mark over each eye, and pale cheek-stripe ; ears white inside, brown outside ; arms, legs, and feet pale grey, fingers and toes brown. Head and body, 500 mm. ; tail, 332 mm. ; hind-foot, 120 mm. ; ear, 58 mm.

BANDED WALLABY

Genus Lagostrophus, Thomas

The banded wallaby is characterized by a naked nose, by having the hind-feet covered with long bristly hairs hiding the claws, and by having a number of dark cross bands on the back. This species is a dry-country animal, and is apparently confined to Western Australia. It is especially numerous on some of the islands off the coast. Mr Shortridge says that he has never seen any animal, not even the rabbit, so numerous anywhere as are these wallabies on Bernier Island, where they seem to have no natural enemies. They were living among thick, low prickly scrub.

ISLAND BANDED WALLABY

Lagostrophus fasciatus fasciatus, Peron and Lesueur. Bernier and Dorre Islands, Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 100.

Fur thick, soft, consisting of under fur, coarse hair, and number of longer piles from two to three inches in length. General colour above grizzled grey, with well-defined cross bands across lower back, connected by indistinct black central line ; longer piles black, with broad white band on upper third; under surface mixed with grey and white; arms and back of legs with reddish tinge; hands and feet dull yellow or yellowish grey, long hairs on feet quite hiding toes; tail yellowish grey above, dull yellow below, with small black pencil of longer hairs at tip. Head and body, 400 mm.; tail, 330–335 mm.; hind-foot, 106–110 mm.; ear, 48–51 mm.

MAINLAND BANDED WALLABY

Lagostrophus fasciatus albipilis, Gould. Isolated localities of extreme south-west of Western Australia. *Proc. Zool. Soc.*, ii, 1906, p. 774.

Compared with the typical or island form, the general colour is darker, the ears are longer and darker, and the fur is longer, while the long white-ringed piles of the coat are more prominent and numerous; the bristle-hairs of the toes considerably surpass the claws, which are shorter than in the island form. Head and body, 400–410 mm.; tail, 390–405 mm.; hind-foot, 110–112 mm.; ear, 60–62 mm.

HARE-WALLABIES

Genus Lagorchestes, Gould

The hare-wallabies have the nose wholly or partially hairy, the central hind-claw long and strong, not hidden by the hair of the foot, the tail evenly haired throughout, and with no trace of a spur on the tip. They have also two small canine teeth in the upper jaw, making the total number of teeth 34, two more than in the other wallabies. The female is larger than the male.

These little wallabies have a wide range, from Queensland to Western Australia and the islands off the coast. Never very numerous, they are found singly, lying up in 'forms' under small bushes or tussocks of grass. They are not only like a hare in appearance, but they rival that animal in their speed and activity. Mr J. Neil McGilp well illustrates this in an account of a hunt after a brown hare-wallaby near Lake Frome, Central Australia. He states: "When first seen, three horsemen and myself rode over the little animal, which just hopped to one side to allow us to pass. I thought it would be an easy matter to collect it, so three of us dismounted to catch the little thing; but we were quite unable to secure it, though it did not seem in any way alarmed. Next we tried our horses, and it was then that the hare-wallaby showed its marvellous turn of speed for such a small creature. We could ride faster, certainly, but as soon as a horseman got close to it, the wallaby shot out at right angles or even almost at full reverse. I have never seen such dodging before. The blessed thing seemed to enjoy itself, for after almost knocking up three horses, it did not, when left alone, leave the locality, but when last seen was within 60 yards, feeding between the roly-poly bushes growing on the sand plain."

Sir Baldwin Spencer found the spectacled hare-wallaby not uncommon in the vicinity of the Macdonnell Ranges. It seemed to him a solitary and nocturnal animal.

L. hirsutus was noted on the Elder Expedition to Central Australia. It was numerous in the northern part of the Victoria Desert, and was found also living in porcupine grass south of the Barrow Range.

Key to Species of Lagorchestes

A. Under fur uniform blackish brown. Ear less than one-third of hind-feet. Two lateral white bands present	
Back grizzled yellowish grey; patch round eye chestnut	*L. conspicillatus conspicillatus*
Back deep fawn; patch round eye rufous .	*L. c. leichardti*
Back light fawn	*L. c. pallidor*
B. Under fur bicoloured, dark slate, with paler tips. Ears more than one-third of hind-foot. No lateral bands	
Rump hair tipped white or grey; black patch on elbow	*L. leporoides*
Rump hair tipped red; no black patch on elbow	*L. hirsutus hirsutus*

Rump hair sandy, no markings. Interorbital breadth over 13 mm. . .	*L. h. bernieri*
Rump hair sandy-rufous. Interorbital breadth only 10 mm.	*L. h. dorreæ*

SPECTACLED HARE-WALLABY

Lagorchestes conspicillatus conspicillatus, Gould. Islands off northern coast of Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 80.

Fur long, coarse, no longer piles projecting above general level; under fur long, soft, thick, uniform dark brown or nearly black above, grey, tipped rufous, on sides of body. General colour above coarsely grizzled yellowish grey; over hairs of back black, with broad band of pale yellow in centre; two white lateral bands on and just above hip; rump pale grizzled grey; sides dull yellowish grey; under surfaces white and slaty grey; head grizzled black and white; well-marked chestnut-coloured patch round each eye; tail very thinly covered above, laterally with pure white hairs, except for basal three inches. Head and body, 480 mm.; tail, 425 mm.; hind-foot, 126 mm.; ear, 33 mm.

LEICHARDT'S HARE-WALLABY

Lagorchestes conspicillatus leichardti, Gould. Northern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 82.

Upper parts deep fawn; patches round eye bright rufous; lateral under fur rich rufous, this colour extending along side of head below ear; under surface and lateral bands nearly white. Head and body, 470–520 mm.; tail, 400–460 mm.; hind-foot, 137–153 mm.; ear, 39–42 mm.

PALE HARE-WALLABY

Lagorchestes conspicillatus pallidor, Thomas. North Queensland. *Proc. Zool. Soc.*, 1908, p. 793.

Much lighter in colour. General colour light fawn. Head and body, 470 mm.; tail, 450 mm.; hind-foot, 156 mm.; ear, 50 mm.

BROWN HARE-WALLABY

Lagorchestes leporoides, Gould. Southern half of east-central districts. *Cat. Mars. and Monot. Brit. Mus.*, p. 82.

Fur long, coarse ; under fur long, soft, slaty grey, broadly tipped brown, sometimes with darker sub-terminal band. Dull rufous band round eyes prolonged forward on sides of muzzle ; ears whitish ; general colour above grizzled brown ; sub-terminal pale band on longer hairs, which is more whitish on rump ; under surface yellowish grey ; well-marked patch outside proximal half of forearm ; tail thinly haired, brownish grey above, whitish on sides and below. Head and body, 450–490 mm. ; tail, 300–320 mm. ; hind-foot, 122–128 mm. ; ear, 45–57 mm.

RUFOUS HARE-WALLABY

Lagorchestes hirsutus hirsutus, Gould. Central and Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 84.

General characters very similar to brown hare-wallaby, but with scarcely a trace of white lateral bands. Rump rich rufous; outsides and backs of legs more or less rufous, sometimes rich red ; band round eye more rufous than rest of head ; tail short-haired, dull grizzled grey. Head and body, 404–450 mm. ; tail, 250–310 mm. ; hind-foot, 112–117 mm. ; ear, 40–44 mm.

BERNIER ISLAND HARE-WALLABY

Lagorchestes hirsutus bernieri, Thomas. Bernier Island, Western Australia. *Proc. Zool. Soc.*, ii, 1906, p. 775.

General colour more sandy. Hair and ears shorter. Tail practically naked above. Head and body, 370 mm. ; tail, 270 mm. ; hind-foot, 112 mm. ; ear, 48 mm.

DORRE ISLAND HARE-WALLABY

Lagorchestes hirsutus dorreæ, Thomas. Dorre Island, Sharks Bay, Western Australia. *Proc. Zool. Soc.*, ii, 1906, p. 775.

General ground colour more rufous than in mainland *hirsutus*. The skull is distinguished by the narrowness of the interorbital region, which measures 10 mm. across, as compared with over 13 mm. in *L. h. bernieri.* Head and body, 400 mm.; tail, 280 mm.; hind-foot, 109 mm.; ear, 43 mm.

Dorcopsis Wallabies

Genus Dorcopsis, Schlegel and Müller

This genus contains many small wallabies which have the hind-limbs comparatively smaller than in the ordinary wallabies. The nose is large, broad, and wholly naked. The ears are small. The hair on the nape from the occiput to the withers is directed forward. The tail is evenly haired and nearly bare at the tip. Like the hare-wallabies, they have a canine tooth on each side of the upper jaw, making the total number of teeth 34; the premolars are large and heavy, the fourth very long antero-posteriorly, generally exceeding the combined length of the first and second molars.

The *Dorcopsis* wallabies are confined to New Guinea. We have very little information as to their habits, but from their small size and dull coloration it is deduced that they are inhabitants of the forests and thickets.

Key to Species of Dorcopsis

A. Whole of nape-hair directed forward	
Back chocolate brown; white stripe in front of hips; arms and hands whitish	*D. veterum* (*mülleri*)
Similar, but smaller in size	*D. mysoliæ*
Back grizzled smoky grey; no stripe in front of hip; arms and hands brown	*D. luctuosa*
Back evenly smoky grey; front of shoulders light nut brown	*D. hageni hageni*
Similar, but colour browner	*D. h. caurina*
Back brownish rufous; hands and wrists naked, white	*D. rufolateralis*
B. Hair of upper nape directed backward, of lower nape forward	
Colour deep grey brown. Head and body, 550 mm.	*D. macleayi*
Colour similar. Head and body, 390 mm.	*D. vanheurni*
Colour shining chocolate brown	*D. rothschildi*

BROWN DORCOPSIS

Dorcopsis veterum (*mülleri*), Lesson. North-west New Guinea and adjoining islands. *Cat. Mars. and Monot. Brit. Mus.*, p. 88.

Male : Fur short, close, glossy, whole of that on nape, neck, and forequarters directed forward. General colour above uniform chocolate brown ; bases of hairs nearly white ; sides with short transverse white stripe running from belly toward back just in front of hip ; under parts white ; head brown ; sides of face paler, with indistinct white cheek-stripe. Ears very short, small. Sides (inner) of hips quite naked. Arms, hands, front of legs white or pale brown ; tail brown above and below, terminal three inches white, nearly naked. Head and body, 825 mm. ; tail, 500 mm. ; hind-foot, 156 mm. ; ear, 42 mm.

Female : Fur on each side of pouch darker than rest of belly, but not forming prominent dark stripes as in *D. luctuosa*. Only two-thirds size of male. Head and body, 530 mm. ; tail, 380 mm. ; hind-foot, 112 mm. ; ear, 35 mm.

LESSER BROWN DORCOPSIS

Dorcopsis mysoliæ, Thomas. Mysol Island, New Guinea. *Ann. Mag. Nat. Hist.*, (8) ix, 1913, p. 507.

Similar to *D. veterum*, but smaller head, 121 mm. in greatest length.

GREY DORCOPSIS

Dorcopsis luctuosa, D'Albertis. Eastern and South-eastern New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 89.

Male : Fur soft, thick, comparatively long, reversed on nape and top of neck. General colour above dark smoky grey ; hairs white for basal half, then black or dark grey, with tips glossy yellow or white ; chin brown ; chest and belly dull grey ; patch surrounding anus white or yellow ; face dark grey, with faint paler cheek-stripe ; arms, hands, legs, feet uniform dark smoky grey ; tail dark brown or black, tip white, naked. Head and body, *600 mm.*; *tail, 320 mm.*; hind-foot, 112 mm.; ear, 36 mm.

Female: Prominent dark band passing down lower belly on each side of pouch; measurements same as in male, except that tail is sometimes shorter.

HAGEN'S DORCOPSIS

Dorcopsis hageni hageni, Heller. New Guinea. *Abh. Mus. Dresden*, vi, 8, 1897, p. 7.

General colour above smoky grey, darker in old males; hair evenly coloured, without any lighter shining points; hair in front of shoulders light nut brown; hair of back from neck to dorsal surface with narrow, almost white, streak; under surface light grey, almost white in female; inner side of thigh ash grey, almost bare. Whorl on shoulders similar to that of *D. luctuosa*, extending over back of head to whorl on forehead. Head and body, 710 mm.; tail, 540 mm.; hind-foot, 145 mm.; ear, 45 mm.

Dorcopsis hageni caurina, Thomas. Mamberano River, Dutch New Guinea. *Ann. Mag. Nat. Hist.* (9) ix, 1922, p. 264.

Like *D. h. hageni*, but colour browner, and sides as dark as back. Head and body, 640 mm.; tail, 440 mm.; hind-foot, 143 mm.

RUFOUS-SIDED DORCOPSIS

Dorcopsis rufolateralis, Rothschild. North New Guinea. *Nov. Zool.*, v, 1898, p. 512.

Shoulders and centre of back from withers to dorsal region black; rest of back, flanks, hips, and hind-legs to knees brownish rufous; under surface bright buff; head and face greyish brown, with dark median line; lower part of nose and face black and naked; ears black, naked inside and on upper part of outside, remainder of outside covered with black pile of velvety hairs; fore-limbs naked, showing few scattered short hairs; hands and wrists naked, white; hind-feet black; lower rump, root of tail, and tail brownish black, last four inches of tail naked and white; from root of tail extending along it for three inches on upper surface is naked pinkish shield of rough corrugated skin; scrotum pale blue. On each side of rectum are two large naked callosities. Size larger than *D. veterum* (*müllerì*).

Note. The following three species were placed in a new genus, *Dorcopsulus*, by Matschie.

MACLEAY'S DORCOPSIS

Dorcopsis macleayi, Miklanho Macleay. South New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 92; *Sitz. Ges. Nat. Fr.*, Berlin, 1916, 2, p. 57.

Fur rather thick, soft, fine. General colour above deep grey-brown; darker mark just above hips, extending very indistinctly toward lower back. Hair of withers vertical or extended upward; hair on back of neck adpressed, extending downward, forming distinct ridge of opposed hairs where it meets nape fur; hair on occiput adpressed, running forward; hair on forehead vertical; irregular line of opposed hairs between the two. Upper lips, chin, throat whitish; belly light brownish grey; whole of body covered with light shining points of longer hairs; tail evenly coloured, brownish above, lighter below, terminal third bare, two inches of tip white. Head and body, 550 mm.; tail, 300 mm.; hind-foot, 100 mm.; ear, 27 mm.; claw, 19 mm.

Dorcopsis vanheurni, Thomas. Doormanpad-bivak, New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 264.

Allied to *D. macleayi*, but smaller and with finer, softer fur. Head and body, 390 mm.; tail, 300 mm.; hind-foot, 100 mm.; ear, 35 mm.

Dorcopsis rothschildi, Thomas. Rawlinson Mountains, North-east New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 672.

Fur long, soft, glossy. Hair of back, 35 mm. in length, dark shining chocolate brown above, dull whitish below;

chest and inguinal region lighter; face and back of ears thickly furred, dark brown; outside of limbs and hairy part of tail dark brown. Head and body, 480 mm.; tail, 270 mm.; hind-foot, 94 mm.; ear, 34 mm.

TREE-KANGAROOS

Genus Dendrolagus, Schlegel and Müller

While the ordinary kangaroos and wallabies are adapted only for living on the ground, the rock-wallabies, by a roughening of their foot-pads, shortening of the hind-claws, and the possession of a long thin tail, are specially adapted for life among the rocks. The tree-kangaroos go further; by having the claws sharpened, and the roughness of the foot-pads and length of the tail accentuated, they are able to climb trees and make themselves quite at home on thin boughs far above the ground. The fore-limbs are larger and stronger and the legs smaller in proportion than those of other members of the sub-family. The possession of two small canine teeth in the upper jaw makes the total number of teeth 34.

There are several well-marked species, two of which are found in North-east Queensland, and the rest in New Guinea. Some are brightly marked, and have heavy coarse fur to shield them from the tremendous rains that occur in the wet season.

The tree-kangaroos are essentially forest animals, living on the ranges, plateaux, and mountains of their habitat, and are not found in the low-lying coastal scrubs. The late C. M. Hoy observed Lumholtz's tree-kangaroo at Ravenshoe, North Queensland. He found that the species spend most of their time on the ground, and ascend the trees only to feed or if pursued by dogs. If disturbed on low trees they usually jump to the ground and make off.

Mr Carl Lumholtz, who first found this species in North Queensland, states that during rainy weather the 'boongarry,' as the natives call it, prefers the low, young trees, and always frequents the most rocky and inaccessible places, near the summit of the mountains. He also noted that it is able to jump from a great height and run rapidly on the ground. This is confirmed by Mr George Hislop in the case of Bennett's tree-kangaroo. He notes also that they are often found in small companies, consisting of a male and several females.

The tree-kangaroos will live readily in captivity, but seldom for any length of time; evidently they require some special food to keep them in health that can be procured only in their forest haunts. Some kept in the Melbourne Zoological Gardens showed themselves to be apt climbers; they were able to ascend a lead pipe or a hanging rope with equal ease. They always descended to the ground tail first, and hopped like a wallaby, but with relatively smaller strides. At times they naturally walk backward. The small ears have not the power of turning in all directions like those of the genus *Macropus*. Tree-kangaroos make a coughing grunt like that of a wallaby. The males are very pugnacious.

The natural pose of the tree-kangaroos is squat, and the back is nearly horizontal, but that this varies in different species is indicated by the amount of hair on the back reversed forward—for this is a natural rain-turning device, and the direction of the hair will follow the natural carriage of the body. Those which have the hair reversed from the withers would be more erect than those which have it reversed from the middle of the back. Doria's tree-kangaroo, which has the hair reversed from the rump, must habitually remain with the fore-part of the body lower than the hips.

Key to Species of Dendrolagus

A. Hair reversed from withers to crown	
a. Body and limbs nearly black	
Tail black	*D. ursinus*
Tail black, white tip	*D. leucogenys*
Tail whitish grey	*D. maximus*
Tail blackish sepia	*D. schoedei*

a^1. Back and sides dark grizzled grey	
Under sides whitish	*D. inustus*
Under sides greyish white	*D. sorongensis*
Under sides putty colour	*D. keiensis*
a^2. Back grey; sides more or less suffused with fulvous	*D. lumholtzi*
B. Hair reversed from behind shoulders	
Dark warm brown	*D. bennettianus*
C. Hair reversed from middle of back	
c. Colour above golden rufous brown; dark line down back	*D. matschiei*
c^1. Colour above dark bistre brown. Nape and rump with parallel lines on each side of spine	*D. goodfellowi*
c^2. Colour above dark chestnut brown. Back with two yellow ochre lines divided by dark chestnut line	*D. burgersi*
D. Hair reversed from lower part of back	
Back and under sides carrot brown	*D. notatus*
E. Hair reversed from root of tail	
Back and under sides dark brown	*D. dorianus*

BLACK TREE-KANGAROO

Dendrolagus ursinus, Schlegel and Müller. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 94.

Nose very thinly haired to level of upper angle of nostril, black, then granulated portion nearly white. Lower lip with two diverging grooves running under chin. Fur of body, limbs, and tail straight, coarse. Face covered with fine under fur only. Under fur short, woolly, pale brown; fur of back of neck, from withers to crown, directed forward, forming transverse crest level with anterior edge of ears. General colour above uniform black; chest and belly white or pale brown; face pale brown or grey, rather darker round eyes. Ears short, rounded, thickly covered outside and on inner margins with soft, thick, woolly black hairs. Back of extremities and tail uniform black, latter sometimes tipped yellow. Head and body, 530 mm.; tail, 590 mm.; hind-foot, 108 mm.; ear, 36 mm.

WHITE-THROATED TREE-KANGAROO

Dendrolagus leucogenys, Matschie. Dorei, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 293.

Allied to *D. ursinus*, from which it differs by having white tip to tail, white sides of neck sharply contrasting with dark sides of head, no rust brown on ears, hair reversed from a whorl between shoulders; between the ears this hair ends abruptly, and gives place to shorter backward-pointing hair of face. General colour above from crown to white tip of tail black; black extending on to outer part of both legs, arms, ears, and sides of neck; upper head, cheeks, chin light soot colour, with grey sheen; males have chest brownish grey, deeper on belly; females have sides of head and throat white, belly light brownish grey. Head and body, 730 mm.; tail, 660 mm.; hind-foot, 100 mm.

GREATER TREE-KANGAROO

Dendrolagus maximus, Rothschild. Mountains of Dutch New Guinea. *Nov. Zool.*, v, 1898, p. 511.

Fur coarse, harsh. Nape hair from withers to crown directed forward. Top of head and from crown to withers black, each hair tipped with earthy grey; back to just above root of tail black; under fur and base of long hairs dark chestnut red; cheeks, chin, throat greyish white; breast and belly reddish grey or greyish buff; fore-limbs brownish grizzled grey; hind-limbs whitish grey, fading into yellowish white on posterior sides of hips; anal region and base of tail yellowish white; tail whitish grey, with dark, ill-defined rings throughout length; hind-toes black. Head and body, 890 mm.; tail, 838 mm.; hind-foot, 152 mm.; ear, 46 mm.

SCHOEDE'S TREE-KANGAROO

Dendrolagus schoedei, Matschie. Eitape, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 296.

Allied to *D. maximus*. Head and back dark chestnut brown, with bronze sheen, darker on neck, lighter on back; under surface grey; chest whitish grey; ears black; cheeks, under lips, chin, throat, front of hind-legs grey. Tail blackish sepia, with many single white hairs; bare patch on root of tail. Head and body, 730 mm.; tail, 850 mm.; hind-foot, 130 mm.; ear, 50 mm.

GRIZZLED GREY TREE-KANGAROO

Dendrolagus inustus, Schlegel and Müller. New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 95.

Fur long, coarse, harsh; under fur soft, woolly; dark brown nape hairs from withers to crown directed forward. General colour dark, coarsely grizzled grey, hairs being dark brown or black for four-fifths of length, then broadly tipped shining yellow; under parts whitish; face brown or black; ears small, thickly haired, outside black, inside yellow or white; arms and legs grizzled grey and white; fingers and toes black; tail hairs mixed white and black, general colour varying according to proportion of either. Head and body, 550–650 mm.; tail, 640–680 mm.; hind-foot, 127–137 mm.; ear, 40–41 mm.

SORONG ISLAND TREE-KANGAROO

Dendrolagus sorongensis, Matschie. Sorong Island, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 300.

Closely allied to *D. inustus*. Hairs on back black, then light brown with grey-white points; only on head are they light reddish chocolate brown. General colour above little lighter than *D. inustus*; under surface whitish grey; face light bone black; outside of ears deep black, except for few brownish hairs on edge, inside of ears yellow, except for black spot on outer edge near root; tail whitish grey. Head and body, 570 mm.; tail, 710 mm.; hind-foot, 120 mm.; ear, 40 mm.

KEI ISLAND TREE-KANGAROO

Dendrolagus keiensis, Matschie. Great Kei Island, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 297.

Allied to *D. inustus*. Hair reversed from whorl on shoulders. Back blackish, thickly dusted dark stone colour; hairs

48. Bridled Nail-tailed Wallaby (*Onychogale frenata*), Male

See p. 212.

49. Lumholtz's Tree-kangaroo (*Dendrolagus lumholtzi*), Male

50. Matschie's Tree-kangaroo (*Dendrolagus matschiei*), Female

have long light points ; interspersed are few hairs of lighter colour, more numerous toward end of tail and absent on sides ; under surface, arms, back of tail, root of tail light putty colour, being in sharp contrast to dark back ; cheeks and face blackish brown, top of head lightly dusted brown ; outside of ears black, with some lighter hairs near top, inside of ears covered with light putty-coloured hairs, with few darker ones intermixed ; tail covered with mixture of dark and light hairs, with white point 9 cm. long, dark indistinct rings where darker hairs are more numerous. Head and body, 690 mm. ; tail, 720 mm. ; hind-foot, 130 mm. ; ear, 40 mm.

LUMHOLTZ'S TREE-KANGAROO

Dendrolagus lumholtzi, Collett. Ranges of North-east Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 96.

Fur short, soft ; under fur thin ; fur from withers to crown reversed. General colour above finely grizzled grey or fulvous grey ; chin black ; chest white or pale grey ; sides and belly pale fulvous white ; face blackish, paler band passing across forehead, just in front of ears, ending on each side in white or yellowish spot behind ears ; back of neck black, gradually passing into grey or fulvous of back, where each hair is pale slaty grey basally, with black sub-terminal ring and lighter tip ; arms and legs pale yellow, darker terminally ; tail grizzled black and yellow. Head and body, 520 mm. ; tail, 520 mm. ; hind-foot, 119 mm. ; ear, 27 mm. (See Fig. 49.)

BENNETT'S TREE-KANGAROO

Dendrolagus bennettianus, De Vis. Ranges of North-east Queensland. *Proc. Linn. Soc. New South Wales*, (2) ix, 1894, p. 578.

Nose tolerably well clothed with short hairs ; space between nostrils naked. Fur long, soft, especially on back ; hair radiates from point some distance behind shoulder, whence it is directed upward to head, meeting hair of face in front of ears, forming irregular crest; hair also reversed on under side of throat. General colour above dark warm brown, black at point of radiation, dark along vertebral line; this colour passes into lighter tint on sides, haunches, rump; back of neck rich reddish brown, fading into chestnut on sides, but again becoming redder on throat; this colour also extends along front edge of fore-limbs; lower surface darker; inguinal region lighter; forefeet black, hind-feet black, with lighter hairs above toes; face grey, passing into chestnut and rufous on head; ears naked within, with few silky hairs at tip; tail cylindrical, tapering, hair gradually lengthening toward tip and forming tuft, at base reddish-brown patch, passing into black, which colour extends for 4 or 5 inches, then becomes lighter rufous brown, tip and ventral surface black. Head and body, 610 mm.; tail, 631 mm.; hind-foot, 134 mm.; ear, 38 mm.

MATSCHIE'S TREE-KANGAROO

Dendrolagus matschiei, Förster and Rothschild. Rawlinson Mountains, North-east New Guinea. *Nov. Zool.*, xiv, 1907, p. 506.

Hair more silky than in other species, directed forward from whorl in centre of back. General colour above, including head, outside of forelegs, base of tail, basal third of hind-legs, throat, chest, bright golden rufous brown; narrow central line on back and the flanks darker; lower half of face and muzzle silver grey; tips of ears, inner surface of legs, under surface bright golden yellow; tail brownish golden yellow. Head and body, 806 mm.; tail, 598 mm. (See Fig. 50.)

Dendrolagus flavidior, Matschie. Sattelberg Mountains, New Guinea. *Sitz. Ges. Nat. Fr.*, Berlin, 1915, 4, p. 94.

This is a differently coloured form of *D. matschiei.* No detailed description is available.

GOODFELLOW'S TREE-KANGAROO

Dendrolagus goodfellowi, Thomas. Owen Stanley Range, Papua, 8000 feet. *Ann. Mag. Nat. Hist.*, (8) ii, 1908, p. 452.

Fur straight, about 2½ to 3 cm. on back; hairs directed forward and backward from pair of prominent whorls about centre of back. General colour above dark bistre brown, suffused with rufous, latter becoming more prominent posteriorly; bases of hair rufous, median portion blackish, ends tipped with shining buff or drab, which gives finely grizzled appearance; under surface and inner sides of limbs ochreous, becoming more rufous on belly, where light colour narrows to breadth of about 3 inches; head dull russet brown, hairs directed backward to crest between ears; backs of ears very hairy, deep rich rufous; nape with two indistinct lighter lines on each side of median one; rump with two parallel ochreous lines along each side of spine, about 6 inches in length and inch apart; forearm blackish in front, reddish brown externally, ochreous on inner aspect; hands golden yellow; hind-legs tawny proximally, gradually paling to golden yellow on feet; ends of toes reddish brown; tail deep rufous at base, then irregularly mottled with rufous brown and yellow. Head and body, 770 mm.; tail, 845 mm.; hind-foot, 124 mm.

Dendrolagus burgersi, Matschie. Western New Guinea, Kaiserin Augusta River. *Sitz. Ges. Nat. Fr.*, Berlin, 1912, 10, p. 571.

Hairs of the body are short and stiff, about 2–3 cm. long on the back; two distinct whorls situated about 2·75 cm. in front of and behind the middle of the back, measured from the posterior edge of ears to root of tail; hair pointing backward on head, lower part of back, the tail, and belly; on upper part of back the hair is directed forward, and on rump downward. Back and ears dark chestnut brown; on the back are two yellow-ochre stripes divided by a chestnut-brown stripe; under surface chestnut brown, a little lighter in centre; upper side of tail dark chestnut brown to point, under side showing several pale ochre rings, of which only two are complete, under side of root of tail and a narrow stripe running to within 30 cm. of point light yellow ochre; upper portion of fore-limbs blackish chestnut brown outside, lighter in tone inside; top of hands chamois colour; hind-feet a little darker; chin and throat white grey; chest brown. Dimensions as in *D. goodfellowi*, but with much shorter tail.

MARKED TREE-KANGAROO

Dendrolagus notatus, Matschie. Mount Schrader, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 294.

Hair rather dense, reversed from point about 10 cm. from root of tail. Bridge of nose, lips, chin, points, edges, inside of ears dark sepia brown; head putty colour, with bright silver sheen, cheeks becoming carrot brown, which colour covers whole of lower body, lower part of back, inner sides of legs, sides of rump; on upper two-thirds of back this deep carrot brown has sheen of gold bronze, sheen being produced through points of otherwise deep brown hair being of lighter colour; sometimes tip of hair is again carrot brown; outer side of arms, legs, feet putty colour; hairs round claws sepia brown; round vent colour saffron yellow for distance of 7 cm. wide and 4 cm. long, yellow colour coming round root of tail and forming dark saffron-yellow spot on upper part of root of tail; tail covered putty-coloured and sepia-brown hairs. Head and body, 630 mm.; tail, 430 mm.; hind-foot, 80 mm.; ear, 45 mm.

Dendrolagus finschi, Matschie. Tami River, New Guinea. *Sitz. Ges. Nat. Fr.*, Berlin, 1916, 4, p. 163.

This species was named provisionally from portion of tail only, which is similar in colour to that of *D. sorongensis*, from which it differs in being longer and more bushy, and in having a corn-yellow mixture toward the root and indications of a stripe on under side.

Doria's Tree-kangaroo

Dendrolagus dorianus, Ramsay. Mount Astrolabe, South-east New Guinea. *Proc. Linn. Soc. New South Wales*, viii, 1883, p. 17.

Male: Hair of body soft, long, dense; base of hairs dark brown, mixed with some woolly under fur; points of longer hairs shining, some with reddish sub-terminal band; whole of hair on back reversed forward from point just above root of tail to head, where it meets hair of forehead and cheeks, which is very soft and woolly, in irregular ridge extending between ears and down side of face; hair of limbs directed normally toward extremities. General colour dark brown; chest appreciably lighter, and extremities darker; nose and fore-part of face black. Rhinarium covered with short fine hair. Ears very short, thickly covered inside and out with woolly hair. Tail evenly tapering, covered with short, stiff adpressed hairs; large yellow spot about 2 inches from base; extreme tip lighter. Head and body, 750–780 mm.; tail, 550–610 mm.; hind-foot, 115 mm.; ear, 34 mm.

Female: Hair generally longer and more woolly than in male, 20 mm. in length on back. Colour of body few shades lighter. Chief difference in tail, which is cylindrical, and covered with long hair, rather soft, and not stiff as in male; hair lengthens toward tip, where it forms brush, light yellowish in colour, 40 mm. long.

SUB-FAMILY POTOROINÆ

RAT-KANGAROOS

This sub-family contains many small kangaroo-like marsupials, characterized by having the middle claws of the fore-feet very long, and the hind-feet without a first toe. The molar teeth decrease in size backward, thus differing from those of the kangaroos, which have the molars increasing in size backward; fourth premolar set in in the same general line as the other teeth, or very slightly bent outward anteriorly; first upper incisor markedly longer than the others.

The rat-kangaroos for the most part live on the surface of the ground, but sometimes live in holes. They are about the size of rabbits, and practically fill the place in the Australian fauna which those rodents do in other parts of the world. Three genera have rather long hind-limbs and proceed like the wallabies, but in the *Potorous* the difference between the hind- and the fore-limbs is not very great, and the animals use all four feet when running.

By adaptive radiation rat-kangaroos have occupied all kinds of country, with the exception of the heavy tropical scrubs of North-east Australia and swampy lands. The habits of the various species are much the same. During the day they will lie up in grass nests, in shallow excavations covered with *débris*, or in underground holes. Trusting to the security of their hiding-places until the last minute, they will dash off at speed from right under one's feet, making straight for the nearest hollow log, cave, or cover. At night many species are fearless, and will come round a camp, searching for scraps of food.

Their voice is a nasal growl, and the males are very pugnacious in captivity; indeed, two should never be kept together in a small enclosure, and young ones should be removed as soon as they leave the pouch. They feed on grasses, the roots of certain yams, and underground fungi, which they scratch up with their long claws.

The bettongs and *Potorous* have prehensile tails, and use them for carrying nesting materials. *P. tridactylus* collects this material in a most systematic manner. First, the animal squats on all fours; then, passing the tail under the body, it takes the material in its mouth, places it in the fore-paws, and thence on to the under surface of the inturned tail. When sufficient has been gathered it raises its body, and, with an inward turn of the foot, kicks the mass into a tidy parcel, grips it with the tail, and hops off to its destination without any apparent inconvenience from the load behind.

B. lesueuri is numerous in Central Australia. It was noted there by the Horn and the Elder expeditions. It lives in the sandhill country, taking shelter under the spinifex.

Often seen in the daytime on the sandy plains and sandhills, the little animal dodged with wonderful speed and agility in and out among the bushes and tussocks of porcupine grass. Mr Shortridge found it numerous farther west, and noted that it makes a small burrow; a number sometimes get together and form warrens similar to those of rabbits.

We have noted Gaimard's rat-kangaroo in the open forest on the Blue Mountains, where specimens were living in small excavations covered with rough grass and *débris*—much the same kind of nests that bandicoots would make.

P. tridactylus is an inhabitant of timbered lands chiefly, and is often found in the forests. When disturbed it, like all the members of this family, makes for a hollow log, and thus is often easily captured.

The rufous rat-kangaroo lives in open grassy country, making rather a large nest of grass under a tussock. There it spends most of the day, but is ever ready to dash away if approached by a person on foot. It does not, however, associate danger with a horse, and a rider can go within a foot or two of the animal without its taking alarm. This species is wonderfully quick, and rivals the hare-kangaroo in expert dodging.

Before the advent of the fox the rat-kangaroos were extremely numerous, so much so that special measures had to be taken by settlers to protect crops and haystacks, but now many species throughout a large part of their range are very rare, and presumably in a short time they will be a thing of the past—wherever the fox can penetrate.

The external characters of the different genera and species are very similar in many cases, though their skulls and dental characters are constant and more easily recognizable.

Key to Genera of Potoroinæ

A. Hind-foot longer than head
  a. Ears rather long, backs blackish. Nose partially hairy, hair extending half-way down septum
    Tail hairy not crested . . . . . *Æpyprymnus*

a^1. Ears short, rounded. Nose quite naked, naked part extending backward in centre
  - Tail crested . . . . . . *Bettongia*
  - Tail thin, cylindrical, evenly short-haired *Caloprymnus*

B. Hind-foot shorter than head
  - Tail evenly haired, tapering . . . *Potorous*

Genus Æpyprymnus, Garrod

RUFOUS RAT-KANGAROO

Æpyprymnus rufescens, Gray. Eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 103.

Two small processes of hair extend half-way down nasal septum. Fur long, coarse; under fur abundant. General colour above coarsely grizzled rufescent grey; hairs dark, then white, red, with extreme tip black; indistinct white stripe just in front of hips; under surface and inner sides of legs greyish white; face pale grey; ears rather long, with backs blackish; hairs on back of hands long, partly hiding claws; feet brownish; tail thickly and evenly haired, pale grey above, whitish below. Head and body, 520 mm.; tail, 380 mm.; hind-foot, 134 mm.; ear, 41 mm. (See Fig. 51.)

Genus Bettongia, Gray

Key to Species of Bettongia

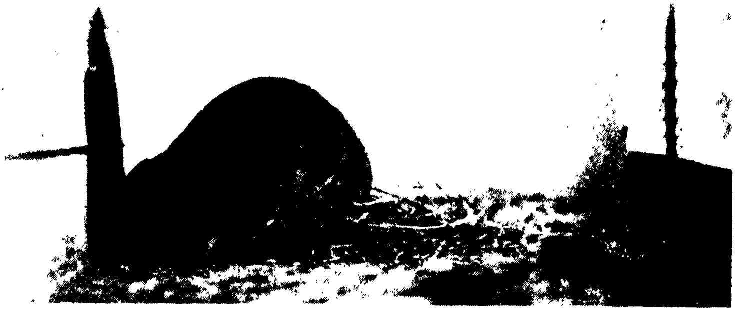
A. Tail not crested
  - General colour grizzled grey. Tasmania . *B. cuniculus*
  - General colour fawn. Central and South-west Australia . . . . *B. lesueuri lesueuri*
  - General colour similar, but darker. Avon district, West Australia . . . . *B. l. grayi*

B. Tail crested
  - Tail 280 mm. . . . . *B. gaimardi*
  - Tail 310 mm. . . . . *B. penicillata*

51. Rufous Rat-kangaroo (*Æpyprymnus rufescens*)

52. Tasmanian Rat-kangaroo (*Bettongia cuniculus*)

Dark Rat-kangaroo (*Potorous tridactylus*)



54. Dark Rat-kangaroo (*Potorous tridactylus*), carrying Grass with its Tail

55. Broad-faced Rat-kangaroo (*Caloprymnus platyops*)

TASMANIAN RAT-KANGAROO

Bettongia cuniculus, Ogilby. Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 106.

Fur close, soft, straight; under fur thick, woolly. General colour above, including head, grizzled grey, longer hairs with white sub-terminal band; under fur dark slate at base, with pale tip, latter colour showing through and giving general grey colour to whole; no hip-mark; under surface white; ears short, coloured like head; limbs white, hairs hiding claws; tail above coloured like body, hair longer, but not forming distinct crest, under side greyish white, tip sometimes white. Head and body, 440 mm.; tail, 300 mm.; hind-foot, 105–120 mm.; ear, 30 mm. (See Fig. 52.)

LESUEUR'S RAT-KANGAROO

Bettongia lesueuri lesueuri, Quoy and Gaimard. Islands of Sharks Bay, Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 112.

Very similar to *B. gaimardi*. Sometimes indistinct indication of hip-stripe. Tail coloured like back, scarcely darker toward end; hairs of upper surface, although fairly long, do not form distinct crest; tip of tail white for from 1 to 2 inches; under part of tail white or pale brown. Head and body, 420–457 mm.; tail, 260–290 mm.; hind-foot, 98–103 mm.; ear, 29–30 mm.

GRAY'S RAT-KANGAROO

Bettongia lesueuri grayi, Gould. South-western and Central Australia. *Proc. Zool. Soc.*, ii, 1906, p. 773.

Similar to typical form, but darker. Fur and ears longer. Head and body, 360–390 mm.; tail, 285–310 mm.; hind-foot, 108–112 mm.; ear, 40–42 mm.

GAIMARD'S RAT-KANGAROO

Bettongia gaimardi, Desmarest. New South Wales. *Cat. Mars. and Monot. Brit. Mus.*, p. 108.

Similar to *B. cuniculus*, but fur woollier and general colour more fawn. Tail coloured like body for basal third, then gradually darkening above, hairs lengthening, until on terminal third there is distinct black crest, with longest hairs upward of inch in length; few hairs of extreme tip white. Head and body, 390 mm.; tail, 280 mm.; hind-foot, 112 mm.; ear, 29 mm.

BRUSH-TAILED RAT-KANGAROO

Bettongia penicillata, Gray. Australia south of tropics, not central. *Cat. Mars. and Monot. Brit. Mus.*, p. 110.

Similar to *B. cuniculus* and *B. gaimardi*, but more rufous round base of ears and sides of head; hands and feet pale brown. Tail long, prominently and distinctly crested along upper surface for terminal third, longer hairs about inch in length; under side of tail pale brown, end not tipped with white. Head and body, 360–390 mm.; tail, 310 mm.; hind-foot, 105–108 mm.; ear, 25 mm.

Genus Caloprymnus, Thomas

PLAIN RAT-KANGAROO

Caloprymnus campestris, Gould. South Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 114.

Face broadened between orbits. Fur soft, straight; under fur thick, abundant. General colour grizzled sandy, darker on back, brighter on sides; longer hairs of head and back slaty grey, with broad grey band and extreme tip brown or black; under fur slate colour at base, then dull sandy, tips brown on head and back, rich sandy rufous on sides, this giving prevailing sandy-rufous tone to whole animal; under parts pale sandy white; ears thickly clothed with short yellow hairs; centre of chest naked; hands and feet white; tail thinly covered with pale yellowish hairs, most thickly clothed part being under side of tip, where there is sometimes small inferior crest. Head and body, 440 mm.; tail, 360 mm.; hind-foot, 121 mm.; ear, 31 mm.

Genus Potorous, Desmarest

DARK RAT-KANGAROO

Potorous tridactylus, Kerr. South-eastern Australia and Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 117.

Naked part of muzzle running back along top for about half an inch, ending posteriorly in blunt point. Fur long, coarse, straight. General colour above in winter shining black, especially in Tasmanian examples ; in summer coarsely grizzled greyish brown, with more or less suffusion of rufous, especially at end of summer season ; under sides white or greyish white ; face long, narrow, greyish ; back of ears brown ; hands and feet greyish brown ; tail grey at base, then brown, darkening to black terminally, tip white. Head and body, 410 mm. ; tail, 230 mm. ; hind-foot, 67–85 mm. ; ear, 35 mm. (See Figs. 53 and 54.)

GILBERT'S RAT-KANGAROO

Potorous gilberti, Gould. South of Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 120.

Similar to *P. tridactylus*, but smaller ; skull characters quite distinct. Head and body, 390 mm. ; tail, 170 mm. ; hind-foot, 68 mm. ; ear, 26 mm.

BROAD-FACED RAT-KANGAROO

Potorous platyops, Gould. South of Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 121.

Nose naked, but naked part not or only slightly extending back in centre above. Face very short and broad in comparison with that of other species. External characters similar to *P. tridactylus*, except tail more or less bicoloured, black above, whitish below. Head and body, 340 mm. ; tail, 190 mm. ; hind-foot, 62 mm. ; ear, 33 mm. (See Fig. 55.)

The last two species are now very rare and possibly extinct.

SUB-FAMILY HYPSIPRYMNODONTINÆ

MUSK RAT-KANGAROO

Genus Hypsiprymnodon, Ramsay

The musk rat-kangaroo is a very interesting animal, as it occupies an intermediate position between the family Macropodidæ (the kangaroos, wallabies, rat-kangaroos, etc.) and the Phalangeridæ, thus tending to link these two well-marked families. There is only one species, which is characterized by a rat-like form, large, thin, naked ears, hands with small, delicate, sub-equal claws, and the hind-foot with a long, clawless hallux, or big toe, which is opposable to the others. Tail naked and scaly. Fourth premolar twisted obliquely outward from the general line of the other teeth.

This little animal is confined to North-east Queensland. It lives in the dense jungles, in damp situations, feeding on insect and vegetable food. It proceeds on all four feet like a rat, which, indeed, it resembles in appearance.

The late C. M. Hoy, who found it on the Atherton Tableland in 1921, states: "When creeping quietly through the bush, I heard a slight rustling, and saw a musk-kangaroo scratching about for food, turning over the leaves, bark, and sticks, searching for insects. It jumped on to a log and lay straddle-legged in a patch of sunlight."

This confirms what was noted by Dr Ramsay, who saw the species in the same district. He remarks that seldom more than one or two are found together, and that he saw them eating palm berries, which they hold in the forepaws, after the manner of a phalanger.

MUSK RAT-KANGAROO

Hypsiprymnodon moschatus, Ramsay. North-east Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 122.

Fur close, crisp, velvety, consisting almost entirely of under fur. General colour all over finely grizzled rusty orange grey, orange deepest on back, less on belly, scarcely perceptible on head and limbs. Ears large, rounded, laid forward reaching posterior canthus of eye, quite naked except at bases behind, blackish flesh colour. Arms and hands brown, hairs short, only running on to metacarpus, leaving fingers quite naked and scaly; palms with five large transversely ridged pads. Feet with hairs on upper surface passing down centre of fourth toe, leaving sides of metatarsus, hallux, and second, third, and fifth digits naked; soles with five prominent transversely striated pads. Tail hairy for basal part, then becoming naked and scaly, black above, lighter below. Head and body, 250 mm.; tail, 162 mm.; hind-foot, 61 mm.; ear, 27 mm.

FAMILY PHALANGERIDÆ

Just as the first family of marsupials, the kangaroos and their smaller allies, are adapted for hopping on the ground and feeding on grass, so the second family is adapted for living in the trees and feeding on leaves, and in some cases on insects.

This group includes many forms, ranging in size from the tiny flying mice (*Acrobates*) and the plump opossum-mice (*Dromicia*) to the graceful flying phalangers, ring-tail phalangers, the furry Australian opossums, and the cuscus. All have sharp claws on the fingers and toes, except on the hallux, or big toe. This is like our thumb, at right angles to the rest of the hind-foot, so that the animal can grasp the bough of a tree firmly; it has no claw or nail. The tail, except in the koala, is well developed, often prehensile, and there is a well-formed pouch, which opens forward.

SUB-FAMILY TARSIPEDINÆ

HONEY MOUSE

Tail long. Snout very long, slender. Tongue extensile. Cheek-teeth minute, rudimentary.

Genus Tarsipes, Gervais and Verreaux

Head long, narrow. Muzzle elongated. Tongue long, extensile. Tail very long, prehensile. Walls of combined urogenital and anal openings prolonged downward as distinct elongated tube, opening antero-terminally, and forming external cloaca.

Our marsupials take on many curious forms and adaptations, and there is none more strange than this little creature, the only member of a sub-family differing in a marked degree from all other types of this remarkable order.

Restricted to a small area of South-western Australia, it lives among the scrub trees, apparently making its home in the nests of birds, and feeding on the nectar from the free-flowering melaleucas and banksias. Doubtless, too, it captures many insects attracted by this food-supply. Like *Dromicia,* it is defenceless, and must rely on colour-protection to escape observation by its enemies. It is not numerous anywhere, and very careful search is required to locate specimens. It seems to live more among the tea-trees than anywhere else. Though one would not suspect such a diminutive creature of travelling, it probably does shift its quarters in search of flowering trees and shrubs.

Lady Grey, whose husband, Sir George Grey, described many of our animals, has given us a very interesting account of *Tarsipes'* habits in captivity. "They are carnivorous," she states, "and feed on moths and flies. . . . It used to take the moths, etc., by their two wings, holding them by its forepaws; it ate the bodies, and the wings it threw away. I never saw it drink. It generally slept during the day, rolled up like a ball, but at night it became very lively, and was fond of climbing the branches of trees. It would hang suspended by its tail to a small branch, and suddenly jump to another."

Mr Johnson Drummond watched a pair sucking the honey from the blossoms of a melaleuca, distinctly seeing them insert their long tongues into the flower, precisely after the manner of honey-eating birds.

HONEY MOUSE

Tarsipes spenseræ, Gray. South of Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 132 ; *Aust. Zool.*, iii, 4, 1923, p. 148.

Fur short, coarse, hispid. General colour above pale grizzled grey, with three longitudinal stripes, central one running from crown to base of tail, and two less distinct running from shoulders to hips ; flanks suffused pale rufous ; under surface yellowish white ; face finely grizzled greyish brown, with darker line in centre and indistinct paler area round eyes. Pouch well developed. Ears evenly rounded ; prominent fold on inner side of bases of outer margins. Palms and soles granulated, each with five distinct pads. Tail cylindrical, slightly furry at base, naked at extreme tip ; otherwise uniformly finely haired. Head and body, 68–80 mm. ; tail, 88–100 mm. ; hind-foot, 14–15·5 mm. ; ear, 9 mm. Female larger than male.

SUB-FAMILY PHALANGERINÆ

Snout short, broad. Tongue not extensile. Tail long, generally prehensile. Two incisor teeth in lower jaw ; teeth large and well developed.

PIGMY FLYING PHALANGERS

Genus Acrobates, Desmarest

About size of mouse. Flanks with narrow flying membrane. Toes provided with broadened terminal striated pad ; length of fore-toes in following order : 4, 3, 2, 5, 1. Tail with broad fringe of hairs on each side. Mammæ, 4. Arboreal ; insectivorous.

This charming little phalanger ranges over the eucalyptus forests of Eastern Australia, where it is one of the most numerous of our arboreal animals. Like most of the tree animals that live in association with the eucalyptus, it keeps to those trees that have a white, smooth bark. A second species has been found on an island north of New Guinea.

Acrobates is found in small family groups—sometimes immature males and females, or a female only with her family. They may be secreted in a small hollow, from two to fifty feet from the ground. The nest, which is globular in shape, may be made of shredded bark, but usually consists of eucalyptus-leaves only. When the animals are at home the entrance is cleverly closed, so that the inmates are quite hidden. Although any hole or crevice may be used as a home, a favourite site is the hollow in the centre of the large, malformed excrescence often seen on a gum-tree. We have found many nests in this position in the Ebor district, New South Wales.

The food of *Acrobates* is insects, probably some of the scale insects, many of which secrete a sweet, sugary substance. In captivity they are fond of sugar, but their favourite food is the termite (white ant).

The ‘ pigmy acrobat ’ is very active, running with a quick, gliding motion, clinging to rough surfaces with sharp claws, or travelling just as easily over a smooth leaf with the aid of the toe-pads. It jumps quickly from one object to another ; it does not make use of the tail in climbing, but doubtless it is of use during the long gliding leaps through space.

PIGMY FLYING PHALANGER

Acrobates pygmæus, Shaw. Eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 136.

Fur soft, straight, silky. General colour above grey or greyish brown (grey in winter, browner in summer) ; under surface white, hair sometimes grey basally ; area round and just in front of eyes brown. Rhinarium naked, well defined, with two well-marked lateral notches below. Whiskers very numerous. Well-marked tufts of hairs growing from just behind eyes, from metatragus, antitragus, and fleshy projections within ear-conch. Ears laid forward reach centre of eye ; inner surfaces and edges lined with fine elongated hairs, outer with short, anteriorly fawn, posteriorly white, hairs. Pouch distinct, completely enfolding young when present. Palms naked, with four broad low pads. Tips of toes with large flattened pads, finely striated. Soles with five pads. Tail laterally fringed, extreme tip below naked. Head and body, 64–70 mm.; tail, 69–78 mm.; hind-foot, 13–13·6 mm.; ear, 9 mm. Specimens from Queensland more brown than those from farther south. (See Fig. 56.)

BROWN PIGMY FLYING PHALANGER

Acrobates pulchellus, Rothschild. An island to north of Dutch New Guinea. *Proc. Zool. Soc.*, 1892, p. 546.

Compared with *A. pygmæus*, head broader and more robust; tail much shorter; body comparatively smaller. Colour above purplish brown; throat and sides of lower jaw pure white; round eye, reaching almost to nostrils, blackish-brown patch. Tail, 60 mm.

FEATHER-TAILED PHALANGERS

Genus Distœchurus, Peters

This genus, which is confined to New Guinea, is closely allied to *Acrobates* in structure, with the exception of having no membrane on the flanks, showing that it is not so highly specialized; on the other hand, as in so many tropical forms, it is much more brightly coloured.

Two sub-species differing slightly from the typical form have been described.

FEATHER-TAILED PHALANGER

Distœchurus pennatus pennatus, Peters. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 139.

Form very dormouse-like. Fur soft, thick, woolly. General colour above dull buff or fawn; under surface white; face white, with two broad, sharply defined black or dark brown bands passing from sides of muzzle through eyes to crown just behind ears. Rhinarium sharply defined, pentagonal. Ears short, laid forward not reaching eye, broader than long, with long anterior basal projection; substance thin, but with several thick fleshy prominences on inner surfaces, each having tuft of long hairs. Prominent black patch just below ear. Soles smooth, not granulated; pads low, rounded, five anteriorly and posteriorly. Tail with basal half-inch furry, remainder nearly naked, but prominently fringed laterally. Head and body, 100–106 mm.; tail, 123–153 mm.; hind-foot, 18·3–19 mm.; ear, 7–7·9 mm.

Distœchurus pennatus dryas, Thomas. Richardson Range, Papua, 3000 feet. *Ann. Mag. Nat. Hist.*, (9) vi, 1920, p. 537.

General colour slightly darker and greyer; upper surface dark wood brown; under side greyish; limbs quite grey. Hind-foot, 19 mm.

Distœchurus pennatus neuhaussi, Matschie. Mountains of North-east New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 292.

Slightly larger: Colour stronger, darker, brightly contrasted; upper surface Verona brown; under parts clay-coloured; throat yellowish; chest creamy; belly more brownish; dark head-marks sharply contrasted black, broadening posteriorly so as almost to meet in middle line and contracting to point, with light mark between them; hands and feet dull yellowish. Hind-foot, 21 mm.

DORMOUSE-PHALANGERS, OR OPOSSUM-MICE

Genus Dromicia, Gray, and *Eudromicia*, Mjöberg

General appearance very mouse-like. Fingers and toes of normal proportions and structure, without broadened terminal pads; length of former in following order: 3, 4, 2, 5, 1; fore-claws not extending beyond pad below them. Base of tail furry, like body, remainder finely scaly, clothed with short fine hairs, except at tip and below, where it is roughened, naked; prehensile. Mammæ, 4.

These rare little creatures, of a light fawn or delicate grey colouring in general appearance, are, as their name implies, like dormice. Like their English namesakes, they spend part of the winter months hibernating; this, as far as is known, is a characteristic unique among Australasian animals. Five species are known, distributed from New Guinea through Eastern and South-western Australia and Tasmania.

They inhabit open wooded country, usually among small eucalyptus, banksia, angophora, and melaleuca trees, among the flowers and leaves of which they obtain an abundance of insects and nectar. Also, as Gould says, they probably feed on the tender buds and flower spikes. The eastern form, *D. nana*, is well distributed, from the neighbourhood of Sydney down through the Dividing Range to Victoria and Tasmania. The western type, *D. concinna*, ranges from the vicinity of Adelaide to the Swan River. The northern species has so far only been recorded from the Atherton Tableland. There are two species in Tasmania and one in New Guinea.

These dormouse-phalangers are most harmless little creatures, quiet in disposition, rather slow in movement, and quite defenceless. They spend the day coiled up in their nests, coming out to feed at night. Then they become alert, running and jumping from limb to limb, making use of their prehensile tail, especially when descending from one branch to another, and acting, as Gould points out, exactly like the English dormice. In captivity they take varied foods, holding the material in their forepaws like squirrels. Those kept in Taronga Park took insects, fruits, nuts, sponge-cake, biscuits, rose-leaves, and eucalyptus flowers. In winter they curl themselves up into a ball and go into complete hibernation, living on the fat stored up in their tails.

When captured in summer the tail is not usually incrassated, and the animal is slender and mouse-like; but as winter approaches it becomes bulkier, the base of the tail becomes very swollen, and the appearance of the animal is very much changed.

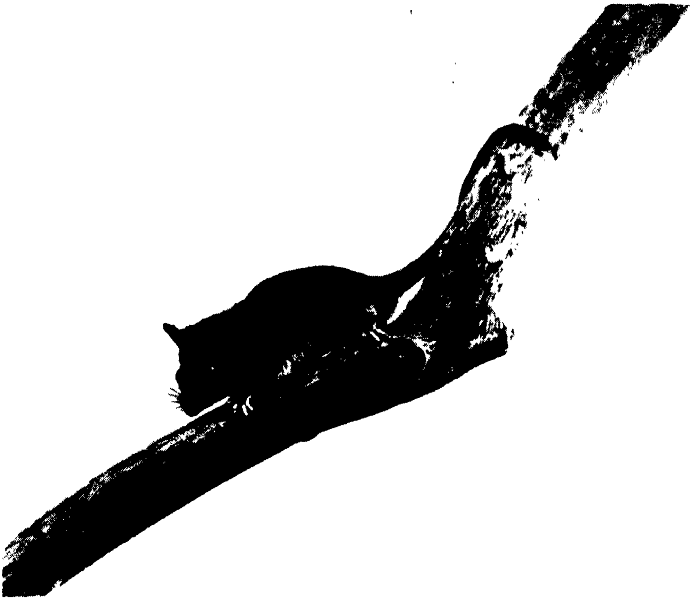
They live in any convenient nook or cranny in a tree, but usually in a hollow limb protected from the weather, making their nest at an angle. The nest is composed of soft bark, which the animals sometimes have to travel a considerable distance to procure. Mr Clive Lord, curator of the Tasmanian Museum, states that in one case he noted that it was a quarter of a mile to the nearest tree on which bark similar to that in the nest was found.

Mr A. H. E. Mattingley, C.M.Z.S., supplies the following interesting notes upon the south-eastern species: "In all the years of my bush wanderings I have only happened on this interesting animal twice. The first occasion was while felling a small tree in the Goulburn valley, Victoria. An opossum-mouse was found in a dormant state. It curled itself into a ball, and allowed itself to be handled without showing any alarm. It seemed quite indifferent to its environment, and slept in this position for about six weeks. To try to rouse it, I hung it to a twig by its prehensile tail, but it grasped the fur of its abdomen with its paws, and remained hanging and dormant, its tail automatically suspending it. After leaving it in this position for several hours without its attempting to seek a different pose, I took it off the twig and put it back in a small nest in its cage. During this period it never ate, nor, as far as I know, drank any water that was placed in its cage, as it did not appear to move either by day or night. Finally, it became active and partook of canary seed and bread and milk, and was then given its liberty.

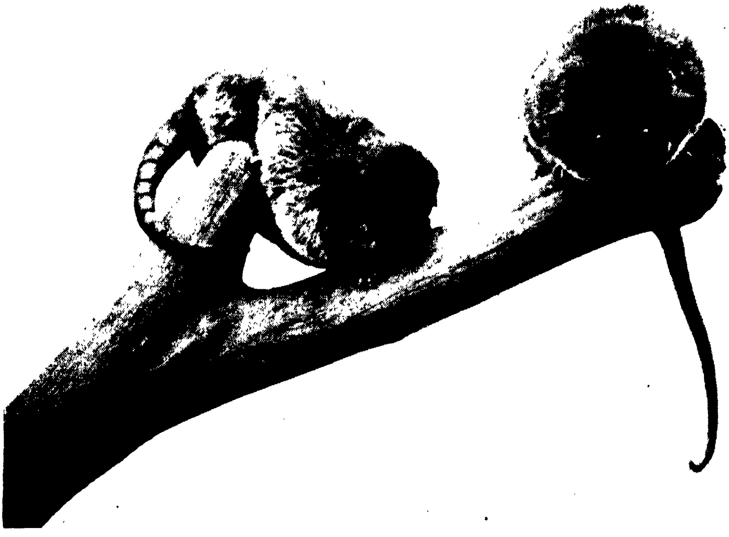
"The second occasion I met with the *Dromicia* was at Underbool, in the Mallee, North-west Victoria, where there were growing a few stunted eucalyptus known as 'mallee.' These were all dead, and most of them rotten and hollow. As I was passing I noticed one with a small crack in the trunk, about two feet from the ground, with a green leaf protruding from it. Introducing the blade of my tomahawk in the crack, I widened the orifice, just in time to see an opossum-mouse disappear. In a small nest of dry leaves lay four young ones. These I put aside and then tried to capture the parent; but it was exceedingly active, after the manner of a lively mouse, and it bolted into the network of roots, most of which were hollow. I searched for some time amongst this labyrinth, but I could not find it. The young ones I photographed and bottled for the National Museum, where the species was identified as *D. nana.*"

56. Pigmy Flying Phalangers (*Acrobates pygmæus*) outside Nesting-hole

See p. 242.



57. DORMOUSE-PHALANGER (*Dromicia nana*)
Usual appearance in spring or early summer.



58. DORMOUSE-PHALANGERS (*Dromicia nana*)
Appearance in autumn.

The chief home of the western form is the hollow head of a dead grass-tree (*Xanthorrhœa*) or the hollow limb of a stunted jarrah. This species varies somewhat in colour, specimens from Albany district being grey, and those from farther north more fawn. Mrs A. Y. Hassall, of Albany, says: "The 'possum-mouse is soft grey in colour, and lighter underneath. In form it is exactly like an opossum; it has a thin tail, without any hair, and carries the young in a pouch. They live in small holes in trees, usually stunted jarrah, from which they pull the leaves to line their nests. One male and two females are always found in the nest. Their habits are nocturnal. I accidentally dropped some in a pond of water; they swam well, and very quickly reached the opposite side, before I could get round."

The Queensland, the New Guinea, and one Tasmanian species have been placed by Mjöberg in a separate genus In speaking of the Queensland species he states: "When found they were curled up closely together. They were quick and lively in all their movements, and used their prehensile tails with remarkable ability."

Key to Species of Dromicia and Eudromicia

Head and body, 90–100 mm.; tail, 90–110 mm. South-east Australia and Tasmania	*D. nana*
Head and body, 80 mm.; tail, 85 mm. South-west Australia	*D. concinna*
Head and body, 70 mm.; tail, 75 mm. Tasmania	*E. lepida*
Head and body, 100 mm.; tail, 144 mm. New Guinea	*E. caudata*
Head and body, 110–119 mm.; tail, 130–133 mm. Queensland	*E. macrura*

DORMOUSE-PHALANGER

Dromicia nana, Desmarest. South-eastern Australia and Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 144.

Fur soft, woolly. General colour above either uniform dull fawnish grey or bright clear grey; under parts little lighter than back or nearly white; feet whitish. Ears large, thin, almost naked, laid forward reaching tip of muzzle. Tail may be thin or very much incrassated. Head and body, 85–100 mm.; tail, 90–110 mm.; hind-foot, 12–16 mm.; ear, 15–17 mm. (See Figs. 57 and 58.)

LESSER DORMOUSE-PHALANGER

Dromicia concinna, Gould. South and Western Australia, from vicinity of Adelaide to Swan River. *Cat. Mars. and Monot. Brit. Mus.*, p. 146.

Form very light, delicate. Fur soft, fine. General colour above either greyish fawn or bright fawn; under surface pure white; indication of darker mark round and in front of eye. Ears long, rather narrow, evenly oval. Tail slender, not incrassated. Head and body, 80 mm.; tail, 85 mm.; hind-foot, 12·2 mm.; ear, 12 mm.

SLENDER DORMOUSE-PHALANGER

Eudromicia lepida, Thomas. Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 142.

Slender, graceful. Fur soft, fine, silky. General colour above pale bright fawn; under surface white; usual darker mark through eye inconspicuously and vaguely defined. Ears large, broad, thin, laid forward reaching beyond tip of muzzle; middle third of margins slightly concave, lower third markedly convex. Head and body, 70 mm.; tail, 75 mm.; hind-foot, 12 mm.; ear, 16 mm.

LONG-TAILED DORMOUSE-PHALANGER

Eudromicia caudata, Milne-Edwards. Mount Arfak, New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 145.

General colour dull rufous; under parts pale yellowish white; face rufous fawn; two broad black bands passing from nose through eye and not quite reaching ears. Ears rather long, narrow, evenly oval, naked. Head and body, 100 mm.; tail, 144 mm.; hind-foot, 16 mm.; ear, 10 mm.

QUEENSLAND DORMOUSE-PHALANGER

Eudromicia macrura, Mjöberg. Atherton Tableland, Queensland. *K. Svenska Vetak. Handl.*, 52, 2, 1916, p. 13.

General colour above fawn; under parts white. Tail very long, narrow, rounded above, flattened below. Second and third toes slightly joined, two pads free from one another. Head and body, 110–119 mm.; tail, 130–133 mm.

LEADBEATER'S OPOSSUM

Genus Gymnobelideus, McCoy

General appearance as in *Petaurus*, but with no flying membrane. Ears large, naked, untufted. Toes of normal proportions, respective lengths being 4, 3, 5, 2, 1. Tail long, cylindrical, bushy. Teeth same as in *Petaurus*. Animal arboreal.

The one species of this family was restricted to a very small district, that of the Bass River valley, in South-eastern Victoria. It has, apparently, long been extinct, and we have no data as to its habits.

LEADBEATER'S OPOSSUM

Gymnobelideus leadbeateri, McCoy. Bass River valley, Victoria. *Cat. Mars. and Monot. Brit. Mus.*, p. 149.

General appearance very like *P. breviceps*, except no flying membrane. Fur soft, close. General colour of upper surface brownish grey; brownish dusky streak from top of head down back to sacrum; dark patch under ear, fainter ones before and behind eye; under surface dull yellowish. Ears large, semi-elliptical, nearly naked toward tip. Fore-feet with terminal toe-pads very large, wrinkled. Palm- and sole-pads large, low, finely striated. Tail long, evenly bushy, hairs longer toward tip, pale brown throughout. Head and body, 135 mm.; tail, 162 mm.; hind-foot, 26 mm.; ear, 19 mm.

Striped Phalangers

Genus Dactylopsila, Gray, and *Dactylonax*, Thomas

Strikingly marked little animals, characterized by having the fingers and toes very unequal; in the forefeet the fourth toe is much the longest, respective lengths being in the order 4, 3, 5, 2, 1; in the hind-feet the fourth and fifth toes are longer than the others; prominent pad on carpus.

The striped opossums, conspicuous in their black and white colouring, are found in Northern Queensland and New Guinea. We have very little information about their habits, as they are rather rare, and so not often observed. Near Cairns they live on the pandanus palms, making nests in the branches. They are reported to feed on grubs and moths, using the long fourth finger on the hands to extract caterpillars from their retreats in the bark.

The late Mr Robert Grant, taxidermist to the Australian Museum, when collecting in the Atherton district procured two, and found the remains of berries and leaves in their stomachs. He gives the following interesting account of their capture:

"Being out in the scrub of the Upper Barron River, hunting for all kinds of mammals, we had four blacks up different trees. One was searching among the elk-horn and orchids when he suddenly called out '*Tamin.*' The other blacks immediately made their way to the tree in which he was. On being roused from their slumber, the *tamin* were a bit dazed, but it was not long before they were scampering nimbly amongst the branches. We were going to shoot them, but the blacks called out they would catch them alive, which they did."

Mr Grant noted that the female had a white tip to her tail, and thinks that this is a distinguishing sexual character.

One of these animals kept in Taronga Park lived well on a variety of food, including condensed milk, biscuits, fruits, and lettuce. It was quiet and inoffensive, and very active at night.

Key to Species of Dactylopsila and Dactylonax

A. Fourth finger rather longer than others	
a. Hands and feet white	
Grey colour of tail extending for two-thirds length	*Dactylopsila trivirgata*
Grey colour of tail extending for half length	*D. occidentalis*
a^1. Hands and feet wholly black	
Tail, 320 mm.	*D. melampus*
Tail, 360 mm.	*D. biedermanni*
a^2. Fingers and toes only black	
White band right across ankle and wrist	*D. picata*
White band half-way across ankle and wrist	*D. kataui*
a^3. Hands white, feet black . . .	*D. arfakensis*
B. Fourth finger enormously longer than others	*Dactylonax palpator*

WHITE-FOOTED STRIPED PHALANGER

Dactylopsila trivirgata, Gray. North-west New Guinea and adjacent islands. *Cat. Mars. and Monot. Brit. Mus.*, p. 160.

Fur close, thick, woolly, rather harsh. General colour above white, with dark longitudinal stripes, central black stripe commencing between eyes, broadening rapidly, passing down back to rump, and along upper surface of tail, lateral stripes commencing on each side of nose, passing across eye and behind ear, down sides of neck and back, sending off short branch in front of shoulder, and second, longer one down outer side of arm to wrist, posteriorly passing down back of hind-limbs to heel; under sides white or pale yellow; chin with prominent black spot; hands and feet whitish. Soles finely granulated. Pads large, rounded, finely striated; supplementary pad on carpus high and narrow, surface smooth. Tail cylindrical, evenly bushy, tip below naked, proximal two-thirds grey, striped above, terminal third either black or with white tip. Head and body, 235–300 mm.; tail, 318 mm.; hind-foot, 44–49 mm.; ear, 24–29 mm.

WAIGIU MOUNTAINS STRIPED PHALANGER

Dactylopsila occidentalis, Matschie. Waigiu Mountains, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 302.

Similar to *D. trivirgata*, but with a darker tail, which is more than half black; in old animals only the end may be white, and the dark coloration may be somewhat browner; the under side of the tail for a distance of 70 mm. and the sides for a distance of 140 mm. are grey; on the upper and under part of the root of the tail, as in *D. trivirgata*, is found a dark band. The dark mark on the chin is parted in the centre; between the ears and the angle of the mouth there is a dark line, 2–3 mm. in breadth, the edges of which are not sharply defined; on the forehead there is a dark line, 4 mm. broad, which widens to 25 mm. between the ears; on the under side of the arm is a small dark cross line; the under arm is white to within 15 mm. of the wrist. Very striking is the somewhat sharply angled nasal ridge, which forms an angle of about 60°. Head and body, 250 mm.; tail, 350 mm.; hind-foot, 50 mm.; ear, 23 mm.

BLACK-FOOTED STRIPED PHALANGER

Dactylopsila melampus, Thomas. South-east Papua. *Ann. Mag. Nat. Hist.*, (8) i, 1908, p. 122.

General characters as in *D. trivirgata*, but in all members there is variation in details of colour pattern. Cheeks and upper lips varying, either white in continuation of belly whiteness or black owing to broadening of lateral dark facial stripe; chin and interramal black, not divided mesially by light line; fore-limbs with dark band that runs down lateral dorsal line, continued on to and including whole of hands; may be few light hairs covering tips of fingers; hind-feet similarly black; tail with or without white tip. Head and body, 285 mm.; tail, 320 mm.; hind-foot, 4·5 mm. (See Fig. 59.)

AROA RIVER STRIPED PHALANGER

Dactylopsila biedermanni, Matschie. Aroa River, South-east New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 303.

Similar to *D. melampus*, but with a smaller head and a longer tail. The prominent black band on the back, which is 5–7 mm. in width, is washed with yellow in the centre. Between the ears and the angle of the mouth, and from there to the chin, there are dark markings, and the light-coloured cheeks appear to be distinctly separated from the sides of the neck. Hands and feet black, with a few light hairs on the ends of the toes. A black line, which starts behind the eyes, is 11 mm. broad between the ears, and widens to 15 mm. on the back. The tail for a length of 70 mm. is black all round; the upper side, at about one-third of its length, is mixed with a few light hairs; from thence for about 170 mm. it is black, with about 90 mm. of the end white; the under side of the tail is lighter, and only quite black near the base. Head and body, 240 mm.; tail, 360 mm.; hind-foot, 45 mm.; ear, 16 mm.

QUEENSLAND STRIPED PHALANGER

Dactylopsila picata, Thomas. North Queensland. *Ann. Mag. Nat. Hist.*, (8) i, 1908, p. 122.

General characters similar to *D. melampus*. Black line passing down limbs ending abruptly at wrists and ankles, leaving two white patches on each side of them, and continuing again on to hands and feet; these not so black as in *D. melampus*; hallux white. Measurements as in *D. melampus*.

SHORT-HAIRED STRIPED PHALANGER

Dactylopsila kataui, Matschie. Fly River, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 304.

Hair very short, in a young animal only 5–7½ mm. in length, and in an older specimen 15–20 mm. This species is similar to *D. picata* in having a light spot on the upper side of the root of the tail, but it differs in having the wrist black, with a few light hairs only on the sides; the white line separating the dark foot from the leg colouring extends only half-way across the ankle from the outside. The black chin-spot does not reach the lip. The black line beginning directly behind the eyes is 13 mm. broad between the ears. The upper side of the base of the tail is white, thence the central black line starts to widen at a distance of about 35 mm. from the base, and at about 80 mm. extends over the whole surface; the under surface of the tail is greyish white to a distance of about 65 mm. from the root, then starts a narrow black line, which gets wider, and at a distance of about 114 mm. covers the whole of the under side, so that the end of the tail for a distance of about 65 mm. is black. Head and body, 160 mm.; tail, 200 mm.; hind-foot, 26 mm.; ear, 15 mm.

ARFAK MOUNTAINS STRIPED PHALANGER

Dactylopsila arfakensis, Matschie. Arfak-Bergen Mountains, New Guinea. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 302.

The black line on the forehead starts about 10 mm. behind the eye. Tail black all round for a distance of about 120 mm.; the foot is sparingly covered with blackish-brown hairs; back of the hand is white, the same as the under part of the arm, which has no dark cross band. The black line between the ears is 11 mm. broad; between the ears and the angle of the mouth is a dark inconspicuous line, with the ends ill defined; the black chin-point is produced backward to a narrow point. Head and body, 320 mm.; tail, 370 mm.; hind-foot, 45 mm.; ear, 19 mm.

LONG-FINGERED STRIPED PHALANGER

Dactylonax palpator, Milne-Edwards. South New Guinea. *Ann. Mag. Nat. Hist.*, (8) vi, 1910, p. 610; *Cent. Mem. Soc. Philmon.*, 1888, p. 173.

General characters as in *D. trivirgata*; fourth finger much lengthened, very slender, claw much smaller than those of other digits. The hair is closer, less long and silky, and greyish tawny in colour; the stripes are smoky. brown; the chin and throat are light in colour, and there is no trace of the black spot which is present in these regions in *D. trivirgata.* Tail greyish brown at the base, becoming brown, almost black, except at the tip, which is whitish. Head and body, 270 mm.; tail, 200 mm.; fourth finger, 31 mm.

The much-lengthened finger and powerful rodent-like front teeth are apparently adaptations for finding grubs in, and gnawing them out of, wood.

LESSER FLYING PHALANGERS

Genus Petaurus, Shaw

Fur very soft, silky. Ears fairly large, oval, nearly naked. Broad flying membrane stretching from fifth forefinger to ankle. Forefingers evenly lengthening outwardly, fifth being longest in larger species and fourth in smaller. Tail evenly bushy throughout.

The members of this genus, the flying phalangers, or, as they are generally called, the flying squirrels, are perhaps the prettiest and most graceful of our native animals. Clothed in long silky hair, softly and delicately coloured, and with large liquid eyes, they are certainly favourites with those who know them. They are closely associated with the Australian bush, and one need not go far in Eastern Australia to note indications of their presence. Light scratches on the trees, with the claw-marks widely spread, will show that one is not very far off, and careful search among the surrounding gums may reveal a hollow bough, where one will be curled up asleep in a comfortable bark nest.

At night, when they are out feeding, the watcher has to listen very intently to find where they are. In the mating season (about April) their startling screech, followed by a series of down-the-scale gurgles, will be heard ringing through the air, but at other times they are silent and difficult to locate. Then it is only the occasional rustle of a leaf or a bit of loose bark that the straining ear can catch; and then, perhaps, by the light of the moon you may get a glimpse of a light body climbing among the boughs, or swiftly gliding from one tree to another.

The yellow-bellied flying phalanger is found in open timbered country. We have noted it in Eastern Victoria, where the yellow box and the red gums were predominant, and in similar open forest areas in Northern New South Wales. The species has a quiet disposition, and does not appear to be very numerous anywhere.

We have a charming note from Mrs C. W. Horniman, of New Korelah, Northern New South Wales, regarding the capture and habits in captivity of a specimen of the yellow-bellied flying phalanger. She writes: "My twelve-year-old son was coming home from school, when he noticed a great commotion round a dead tree. Riding across, he saw two full-grown flying squirrels being attacked by butcher-birds, magpies, and a crowd of noisy miners. Just as he arrived, one squirrel floated down to a lower branch, and, struck by a swooping bird, hit her head on a branch, and fell to the ground, when the baby fell from her back. The mother raced up a near tree and floated off to another. So the boy put the young one in his pocket and brought it home. Fed on milk, it thrived, and was especially fond of my daughter Marjory, who brought it up. Recently we put 'Squirry' on a tree-stump 12 feet high, and six of us stood around; the animal looked at us all, then floated down on to Marjory. It was put up again and we changed positions, with the same result!"

As with most of the marsupials, the young 'squirrel' is born in June. It is carried in the pouch for two months, and then on the back for a further period, until able to lead an independent existence.

The squirrel phalanger has much the same range as the yellow-bellied phalanger, but perhaps does not extend quite so far south. It inhabits the coastal ranges, in moderately dense white-barked eucalyptus country, where the trees are not very big.

59. BLACK-FOOTED STRIPED PHALANGER
(*Dactylopsila melampus*)
See p. 252.

60. YELLOW-BELLIED FLYING PHALANGER
(*Petaurus australis*)

61. Squirrel Flying Phalangers (*Petaurus sciureus*)

62. Short-headed Flying Phalanger (*Petaurus breviceps*)

The smallest of the Australian group, *P. breviceps*, has a much wider range, and extends farther inland, chiefly inhabiting the open forest. It lives at times in quite small trees, and is rather variable, having two distinct local races, one from Northern and another from Eastern Australia. It was introduced into Tasmania in 1835; there it is now very numerous. It makes a delightful pet, and is very easily kept and bred in captivity.

Key to Species of Petaurus

A. Tail more than 400 mm.
  Colour dark brown or brownish grey, belly orange . . . . . *P. australis*
B. Tail 250 mm.
  Colour above grey, under sides white, with tinge of yellow . . . *P. sciureus*
C. Tail less than 230 mm.
  Colour grey above, white with yellowish tinge below, tip of tail may be white . *P. breviceps*
  More or less suffused with fawn all over; markings on face may be very distinct *P. papuanus*

Yellow-bellied Flying Phalanger

Petaurus australis, Shaw. Eastern Australia, from Northern Queensland to Southern Victoria. *Cat. Mars. and Monot. Brit. Mus.*, p. 151.

Rhinarium naked, finely granulated. Fur long, fine, silky, very dense in winter. General colour above rich brown, more or less shaded amber or grey; median line down dorsal area dark brown; under surface orange or cream colour; chin, inner sides of wrists and ankles blackish; edges of parachutes orange, except near insertions, where they are broadly fringed black. Ears long, narrow, naked inside and terminally outside. Hands, feet above black; palms, soles naked, finely striated; pads broad, rounded, ill defined. Tail very bushy, brownish grey, darker at tip. Mammæ, 2. Head and body, 300–315 mm.; tail, 420–480 mm.; hind-foot, 37 mm.; ear, 45 mm. (See Fig. 60.)

SQUIRREL FLYING PHALANGER

Petaurus sciureus, Shaw. Eastern Australia, from Mackay, Queensland, to Victoria. *Cat. Mars. and Monot. Brit. Mus.*, p. 153.

Fur soft, fine, slightly woolly. General colour above soft pale grey, with well-defined dark dorsal band ; upper surface of parachute darker, edges fringed white or yellow ; under surface white, suffused yellow. Ears naked inside and terminally outside ; deep black patch along external base, succeeded posteriorly by prominent white or yellowish patch. Palms and soles as in *P. australis*. Tail very bushy, grey, dark tip. Head and body, 210–250 mm. ; tail, 250–280 mm. ; hind-foot, 32–35 mm. ; ear, 34 mm. (See Fig. 61.)

SHORT-HEADED FLYING PHALANGER

Petaurus[1] *breviceps*, Waterhouse. Northern Territory and Eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 156.

Fur very fine, shorter, rather more adpressed than in other species. General colour above dull grey, with scarcely defined dorsal line ; frequently prominent black mark on forehead and line running from nose, through eyes, to ear, base of which is externally black, with white patch anteriorly and posteriorly ; under sides whitish ; tail grey black at tip, rarely white-tipped. Head and body, 175 mm. ; tail, 205 mm. ; hind-foot, 29 mm. ; ear, 28 mm. (See Fig. 62.)

NEW GUINEA SHORT-HEADED FLYING PHALANGER

Petaurus[2] *papuanus*, Thomas. North-east New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 158.

Hair fine, short, adpressed. Upper surface smoky grey, suffused fawn or dull yellow ; black lines on face and back conspicuous ; white mark behind ear ; under surface yellow or fawn, darker along sides of flying membrane ; tip of tail black. Head and body, 140 mm. ; tail, 176–182 mm. ; hind-foot, 25–26 mm. ; ear, 19–21 mm. (See Fig. 63.)

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[1] Sub-genus *Petaurula*, Matschie, *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 261.

[2] Sub-genus *Petaurella*, Matschie, *ibid.*, p. 261.

63. New Guinea Short-headed Flying Phalanger (*Petaurus papuanus*)
Showing way of carrying young.

64. Greater Flying Phalanger (*Petauroides volans*),
Smoky-grey Type

GREATER FLYING PHALANGERS

Genus Petauroides, Thomas

Fur very long, soft, silky. Ears large, naked inside, furry outside to tip. Flying membrane extending from elbow to knee. Order of length of fingers 4, 3, 5, 2, 1. Tail long, cylindrical, evenly bushy, extreme tip beneath naked.

The genus *Petauroides* includes the greater flying phalanger from Eastern Australia and the lesser form from Central Queensland. Although in skull characters they are rather more closely allied to the ring-tail opossums (*Pseudochirus*) than to the smaller flying phalangers (*Petaurus*), their external characters, mode of living, and peculiar call are exactly the same as those of the latter. We have, therefore, placed them after *Petaurus* instead of after the ring-tails.

This beautiful animal, the largest of our flying phalangers, is very plentiful in the heavy eucalyptus forests of Eastern Australia, extending from North Queensland to Southern Victoria. It is in this region the most numerous of our arboreal animals.

Living among the highest trees, and being strictly nocturnal, the greater flying phalangers are not always easy to find. During the mating season one may be guided by their call—a shriek succeeded by a series of loud gurgling notes, starting full and long and rapidly diminishing. At other times they are quite silent in the bush, and difficult to locate. By standing perfectly still, with every sense alert, you may hear the grating of a piece of loose bark, or the rustle of the leaves, as the animals approach, impelled by curiosity, to see the invader of their sanctuary. But the surest indication of their presence is to see an animal gliding swiftly from the top of one tree to the foot of another, and to hear the *clop* as the creature lands on the bark. To catch the phalanger at a low elevation you must, however, be quick, as it climbs rapidly.

A measured flight by one of these animals from the top of one tall eucalypt to the base of another was 80 yards; another flight, of 55 feet, occupied 1½ seconds.

As far as we have been able to ascertain, the only enemies of *P. volans* are the powerful owl and the introduced fox; the latter occasionally catches them on the ground.

During the daytime the flying phalanger lives in a hollow, the highest that can be found. This it lines with long strips of ribbon-like bark, between ½ and ¾ inch in width. The food consists of the leaves and buds of eucalyptus-trees. Careful examination of the contents of several stomachs of animals taken from the forests has not revealed anything else, but in the Myall Lakes district (New South Wales) we have observed this species on the casuarina-trees; in one such case the contents of the stomach, although much masticated, seemed to be the casuarina-leaves. Mr Ralph C. Blackett, forest ranger at Queanbeyan (New South Wales), states that they chiefly feed on *E. regnans*, and to a lesser extent on *E. viminalis*, *E. fastigata*, *E. australasiana*, and other narrow-leaved peppermints.

The fur, although soft and fine, lacks elasticity. The skin, too, is as thin as tissue paper, so it has no market value.

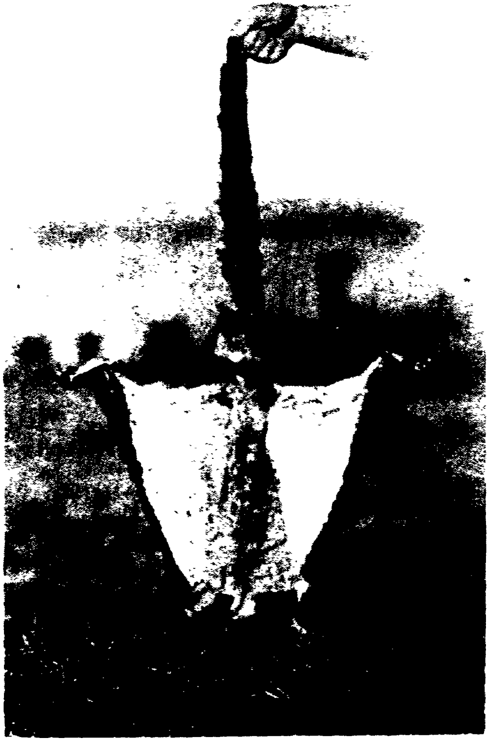
These phalangers live well in captivity, provided they are properly fed and not exposed to the light. A beautiful white specimen, of which a photograph was secured, was actually taken from a fox, which was surprised in carrying it to its den. It dropped the phalanger uninjured, to make good its own escape. This phalanger readily ate *E. sieberiana*, being especially fond of the flowers, and preferring the bark of the branches to the leaves. It loved to climb to a perch at the top of a veranda about 10 feet high, and would then take a flying leap to the floor, alighting perhaps 12 feet away. When walking on the ground it usually carried its tail well over its back. Experiments showed that the tail is in no sense prehensile.

GREATER FLYING PHALANGER

Petauroides volans, Kerr. Eastern Australia, from South Queensland to Victoria. *Cat. Mars. and Monot. Brit. Mus.*, p. 164.

Hair very long, fine, not adpressed. Colour very variable; upper surface from black to smoky grey or creamy white;

65. Greater Flying Phalanger (*Petauroides volans*), White Type



66. Greater Flying Phalanger. Showing Membranes

67. Eastern Australian Ring-tail Opossums (*Pseudochirus laniginosus*), Normal Type
See p. 267.

68. Eastern Australian Ring-tail Opossum (*Pseudochirus laniginosus*), Light Type
See p. 267.

under surface sooty grey, greyish white, or pure white. Ears large, laid forward reaching beyond tip of muzzle; inner surface naked, outer surface furry to tip. Hands and feet thickly fringed with hair. Flying membrane extending from elbow to knee. Tail evenly furred, usually darker terminally, under part of tip naked. As a rule colour darker in winter than in summer. Animals from Gippsland (Victoria) dead black above and on tail; pure white on under sides; Queensland and New South Wales specimens usually smoky grey; white specimens common. Head and body, 430–480 mm.; tail, 490–550 mm.; hind-foot, 50 mm.; ear, 56 mm. (See Figs. 64, 65, and 66.)

NORTH QUEENSLAND FLYING PHALANGER

Petauroides volans minor, Collett. North-east Queensland.
Cat. Mars. and Monot. Brit. Mus., p. 166.

Similar to larger form; shows same colour variations, but is much smaller; upper canine tooth and first premolar less developed. Head and body, 300 mm.; tail, 450 mm.

RING-TAIL OPOSSUMS

Genus Pseudochirus, Ogilby

Smaller and more slender than opossums of the genus *Trichosurus*, the ring-tails are widely spread over Australia, Tasmania, and New Guinea. They are characterized by slender bodies and long, prehensile tails, which taper and are naked underneath for a varying length at the end. The fore-toes have their length in the order 4, 3, 5, 2, 1, the two inner ones being widely separated from the rest, and opposable. Mammæ, 4. Teeth are the same as in *Trichosurus*. Each ring-tail is arboreal, though at least two species are principally rock-dwellers.

The members of this genus are very even in type. Their rather woolly fur is sombre in coloration and of moderate length, though some of the New Guinea species have long, dense coats. This is rather a curious thing to find in animals from the tropics, but the climate of the mountains, being in places excessively damp, calls for special protection.

As a rule the ring-tails live in scrubby country. They are, however, often found in the forests, chiefly in the secondary growth, though occasionally they will find lodgment in a hole high up in some giant eucalypt. The females of some species live in large nests constructed of ferns, leaves, bark, and twigs, which they place in small trees or tangles of vines at no great height from the ground.

Most of these animals are nocturnal, though some found in the dark scrubs in Queensland and New Guinea move about during the day. It is amazing to note the skill with which they will run about the foliage, and that quite silently, even passing from tree to tree when the branches are not touching. To accomplish this feat without jumping a ring-tail will run up a slender bough until its weight brings the branch down to the adjoining tree; this will be caught with the fore-paws, and the weight of the body transferred while retaining hold with the tail of the limb just left. If the trees are too far apart to allow of this being done, an opossum will make for the ground and hide in the undergrowth.

The voice of the ring-tail, or at any rate of the Southern Australian species, is quite distinctive. Ordinarily it is a low "*Chit! Chit!*" uttered several times, but they can make a much louder sound. One evening a pair and two young ones were disporting on a tree adjoining a veranda of a house in Mosman, a suburb of Sydney. An electric light was suddenly switched on, whereupon one of the parents crept forward into full view, and uttered a series of sharp sounds like the excited chattering of an English squirrel. The object of this was probably to bring itself into prominence and allow the youngsters to escape.

This genus has a very wide range of food-plants, feeding on many scrub trees, including several species of eucalypts, especially the flowers of peppermint-gums. They like the leaves of the 'geebŭng' (*Persoonia*), wild grape, etc., and if near cultivated gardens they will come after the leaves of the *Passiflora*, roses, and fuchsia. In captivity they will take almost any vegetable food or fruits, but, like many other Australian animals, they cannot endure light, and must have a dark box in which to sleep during the day.

The Eastern Australian ring-tail opossum is found from Queensland to South Australia. It is very variable in colour, ranging from grey in the north to rufous in the south. It is found both in forest and scrub. The female makes a large oval nest in a low tree, and brings forth two—rarely three—young during the winter months. The male will have to be looked for in a hollow in some adjoining tree. This form, with some variation in colour, but with the same habit, extends throughout Southern Australia and Tasmania.

Ps. herbertensis lives in the dense scrubs, and is purely nocturnal. The late Mr Robert Grant, taxidermist to the Australian Museum, gives the following account of a hunt after them: "The aborigines select a likely spot in the thick scrub, and some ascend different trees in the vicinity with the aid of the climbing cane. They then diligently search the staghorn, fern, and orchid clumps in the vicinity, and the tops of the bangalow palms, and as soon as they have driven the animals from their sleeping quarters they catch them alive, give them a tap on the head, and throw them down." This species did not build a nest.

Ps. h. colletti, which Waite has distinguished as a subspecies, has, according to native information collected on the spot by Grant, quite different habits, in that it builds a large nest like that of *Ps. peregrinus*; the nests were placed in saplings about 20 or 30 feet from the ground.

Ps. lemuroides, also an inhabitant of the northern scrubs, is to be found where the undergrowth is dense and abundant, and in the low trees in swampy districts. It builds a circular nest in the branches, easily distinguishable from the oval nest of *laniginosus*. Grant, who also observed this species in its habitat, states that it was frequently met with in the scrubs of the Upper Barron River. It is very much more active and agile than the other species, taking the most extraordinary leaps among the branches, always in a downward direction, like those of the large flying phalanger.

In this it is aided by a rudimentary membrane, indicated by a ridge of fur about an inch long on each flank, which, although distinguishable in the live animal, is not prominent in the skin.

Key to Sub-genera and Species of Pseudochirus

A. *Pseudochirus*. No dark line on back. Ears longer than broad. End of tail white; naked under part as long as head. Australia only	
Dark brownish grey, no rufous; small ear-spot whitish. North-east Queensland	*Ps. peregrinus*
Dark smoky grey, may be tinge of rufous. Small white ear-spot. Western Australia	*Ps. occidentalis*
Dark smoky brown. Back of ear white. Tasmania	*Ps. cooki*
Slaty grey, suffused with brown or rufous. Patch at base of ear whitish. Eastern and South-eastern Australia	*Ps. laniginosus*
Umber brown all over; back of ears like rest of head. Queensland	*Ps. herbertensis herbertensis*
Dark greyish brown, rump and base of tail black	*Ps. h. colletti*
B. *Pseudochirops*. Form robust. Dark line on crown and generally down centre of back. Ears broader than long. Tip of tail not white except in *Ps. archeri*. New Guinea only, excepting *Ps. archeri*	
Grizzled rufous grey, white spot above and below eye and posterior border of ear	*Ps. dahli*
Silvery coppery brown, silvery lining to dorsal band, ears with yellowish spot on outer edge	*Ps. corinnæ*
Silver lining to dorsal band delineated outward by dark band on either side	*Ps. burgersi*
Grizzled greyish green, suffused with shining yellow. Two indistinct lines on back. Ears with posterior edges and spot beneath their bases white	*Ps. archeri*
Shining coppery brown; no light markings on ears	*Ps. albertisi albertisi*

Dark cross on crown. Hair longer	*Ps. a. coronatus*
Uniform coppery. Dorsal line not strongly marked. No line on head	*Ps. cupreus*
Shining coppery brown. Central line more defined, extending to between ears. Back of ears bright isabelline	*Ps. schultzei*
C. *Pseudochirulus*. Form slender. Dark line on back, if present, ill defined. Ears small, rounded, broader than long. Head yellowish or tawny, at least round base of ears. Tip of tail not white except in *Ps. caroli*. New Guinea only	
Silvery grey, face and cheeks brownish yellow, back of ears dark brown, continued on to side of head	*Ps. canescens*
Smoky grey, brownish on middle line, head tawny ochreous, backs of ears tawny	*Ps. avarus*
Dull silvery grey, crown and forequarters rufous, ears with blackish patch before and behind	*Ps. forbesi*
Silver grey, with slight rufous tinge, face grey, ears nearly black, with rufous edges	*Ps. schlegeli*
Buffy brown, ears and patch in front black	*Ps. caroli*
Greyish brown, suffused with yellowish, forehead and back of ears ochre colour	*Ps. barbatus*
Smoky grey, throat black; prominent black markings on head; ears tawny ochreous	*Ps. larvatus*
Isabelline grey, ears coloured like back of head	*Ps. capistratus*
Greyish; back of ears and patch below blackish brown; orange patch on basal half of under side of tail	*Ps. gyrator*
D. *Hemibelideus*. Tail uniformly furred for whole length above; naked under part less than length of head	
Body blackish or brownish grey, grizzled reddish brown on shoulders. Tail shorter than head and body	*H. lemuroides*
Body uniform fawn, lighter on lumbar region and head. Tail equal in length to head and body	*H. cervinus*

Sub-genus Pseudochirus, Matschie

Body rather slender. No dark line on back. Ears longer than broad. End of tail white, naked under part as long as head, hairs very short on distal upper part.

QUEENSLAND GREY RING-TAIL OPOSSUM

Pseudochirus peregrinus, Boddaert. Northern Queensland, extending to Cape York. *Cat. Mars. and Monot. Brit. Mus.*, p. 172.

Fur rather short, and not very dense. General colour above dark grey, the colour being darkest on the dorsal area and lighter on the flanks; a brown admixture present, especially on the lower back; under surface whitish or creamy; upper surface of fore- and hind-limbs and paws brown, darker than in *Ps. laniginosus*; base of ear blackish brown, with a small white spot at the outer base; terminal third of tail whitish. Head and body, 290–302 mm.; tail, 320–345 mm.; hind-foot, about 44 mm.

Compared with *Ps. laniginosus*, the fur is shorter and not so dense, and on the back is of a darker grey basally; the paws are darker, and the white spot behind the ear is smaller.

WESTERN RING-TAIL OPOSSUM

Pseudochirus occidentalis, Thomas. Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 174.

Form and character similar to *Ps. peregrinus*. General colour above deep smoky grey; under surface white; hands and feet darker than rest of limbs; white part of tail extending from 4 to 6 inches, naked part below smooth. Ears thinly haired; white spot on posterior side small. Head and body, 325 mm.; tail, 300 mm.; hind-foot, 43 mm.; ear, 23 mm.

TASMANIAN RING-TAIL OPOSSUM

Pseudochirus cooki, Desmarest. Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 176.

Fur very thick, close, woolly. General colour above dark smoky brown; under surface white. Ears large, rounded, anteriorly brown, posterior edge generally white; hands and feet dark brown or black. Tail dark brown, distal end white; naked part smooth, extending from 4 to 5 inches. Head and body, 350 mm.; tail, 325 mm.; hind-foot, 55 mm.; ear, 26 mm.

EASTERN AUSTRALIAN RING-TAIL OPOSSUM

Pseudochirus laniginosus, Gould. East and South-east Australia, from South Queensland to South Australia. Gould, *Mamm. Aust.*, i, Pl. 20.

Fur soft, dense, woolly. Colour very variable, from clear dark slaty to grizzled grey or greyish rufous, usually with a suffusion of rufous or brown upon face, fore- and hind-limbs, and paws, these parts being noticeably lighter than in *Ps. peregrinus*; under surface white, more or less suffused with cinnamon; prominent white spot at base of ear; terminal part of tail varying from one-half to one-quarter, white. Naked part below, three to four inches in length, smooth, transversely striated, not shagreened. Head and body, 290–350 mm.; tail, 320–360 mm.; hind-foot, 40–45 mm.; ear, 35–40 mm. (See Figs. 67 and 68.)

This animal has long been known as *Ps. peregrinus*, but, as Mr Oldfield Thomas recently pointed out, the animal to which that name rightly belongs came from the Endeavour River, and is different from the present species.

Two sub-species of *Ps. laniginosus* have been described: *Ps. laniginosus victoriæ* (Matschie), a small-toothed, pure greyish form, from Otway Forest, Victoria, which is readily distinguished from the other sub-species, the South Australian *Ps. laniginosus notialis* (Thomas), by its lack of the reddish forearms found in the latter form.

HERBERT RIVER RING-TAIL OPOSSUM

Pseudochirus herbertensis herbertensis, Collett. Herbert River district, North Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 170.

Fur thick, close, woolly. General colour above dark amber or smoky brown; tips of hairs sometimes shining coppery; chin brown, under surfaces either mixed grey and white, with irregular pure white patches, or wholly white, this colour also occasionally passing round proximal end of limbs in form of white rings; face uniform dark brown; no lighter markings near ears, but indistinct blackish line runs from between eyes to nape. Ears projecting but little beyond fur, thinly hairy outside, nearly naked inside. Limbs black. Tail tapering, hairs woolly to tip, uniform smoky brown, with from 1 to 3 inches of tip white; naked part below from 5 to 6 inches in length. Head and body, 360 mm.; tail, 315–330 mm.; hind-foot, 40–45 mm.; ear, 12·5–15·5 mm.

Pseudochirus herbertensis colletti, Waite. Cairns district, North Queensland. *Rec. Aust. Mus.*, iii, 5, 1899, p. 93.

Fur longer, less wavy, softer, much greyer and darker; hairs behind shoulder white or yellowish; rump and coloured portion of tail black; ears rich rufous without; chin grey. Head and body, 260–320 mm.; tail, 245–310 mm.

Sub-genus Pseudochirops, Matschie

Body robust. At least one line on centre of crown generally continued down back to tail. Ears broader than long. Tip of tail white only in *Ps. archeri*; tail well haired at base, hairs getting shorter toward tip. Hind-foot one-seventh of length of body. Gland on upper side of root of tail.

ROCK RING-TAIL OPOSSUM

Ps. (*Pseudochirops*) *dahli*, Collett. Mary River, Queensland. *Proc. Zool. Soc.*, 1897, p. 329.

Fur long, woolly. General colour above grizzled grey, more or less suffused rufous, longer hairs having white tips;

rump more rufous; under parts lighter; rufous spot on side of breast; tail rufous grey, tip almost naked; head proportionately grey; black median line and whitish spot above and below eye. Ears short, broad, long-haired on posterior roots, more thinly covered toward tips, well haired inside along prominent folds; small patch of white on lower part of posterior border. Head and body, 450 mm.; tail, 270 mm.

Thomas has proposed the sub-genus *Petrosuedes* for this species, *Ann. Mag. Nat. Hist.*, (9) xi, 1923, p. 250.

VANAPA RING-TAIL OPOSSUM

Ps. (*Pseudochirops*) *corinnæ*, Thomas. South-east and North-east New Guinea. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 142.

General appearance above similar to *Ps. albertisi.* General colour of back lighter and more silvery, especially where it borders dark dorsal line; ears closely hairy to edges, but no long black tufts, lower part of outer edge with yellowish spot; under surface dull rufous grey, without mesial white markings; hands, feet, tail scarcely darkening terminally; digits lighter than metapodials. Terminal half of tail naked, coarsely shagreened on under side. Centre of chest without skin gland. Head and body, 310 mm.; tail, 320 mm.

BURGER'S RING-TAIL OPOSSUM

Ps. (*Pseudochirops*) *burgersi*, Matschie. Mount Schrader, New Guinea. *Sitz. Ges. Nat. Fr.*, Berlin, 1915, 4, p. 89.

Form and general coloration similar to *Ps. corinnæ*, but two bright metallic glistening bands flanking dark dorsal band are delineated outward by dark band on either side; tail shorter and darker toward tip; hairs of back slaty grey basally, then black, followed by narrow band of white and yellowish brown, glistening to silver and gold bronze in strong light, tips black; longer black hairs among shorter fur. Central band extends from level of eyes to within 50 mm. of root of tail; flanking bands extend from behind shoulders to as far back as central band. Exterior of ears same colour as forehead; upper part of breast yellow brown, toned to orange; lips, inner surface of limbs, lower surface except breast bright smoke grey, suffused with orange; tail dark brown for 70 mm., increasingly darker toward tip. Head and body, 335 mm.; tail, 250 mm.

YELLOW RING-TAIL OPOSSUM

Ps. (*Pseudochirops*) *archeri*, Collett. Atherton Range and *Herbert River district, Queensland. Cat. Mars. and Monot. Brit. Mus.*, p. 177.

Fur soft, close, thick. General colour above grizzled greyish green; two indistinct whitish lines down back, more distinct on neck; tips of some of longer hairs on back and outside of limbs bright shining yellow; chin greyish white; under surface white; pale yellow spot above and below eyes. Ears very short, broader than long, rounded, posterior edges and spot beneath bases white. Base of tail like back or yellowish fawn, distal third white; naked part beneath about half length. Head and body, 350 mm.; tail, 325 mm.

D'ALBERTIS'S RING-TAIL OPOSSUM

Ps. (*Pseudochirops*) *albertisi albertisi*, Peters. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 178.

Form stout, clumsy. Fur very long, soft, thick. General colour shining coppery brown; face grizzled greyish brown; no lighter markings round eyes or ears; back glistening coppery brown, grizzled with black hairs, dark brown basally, yellow terminally; dark mesial line down back; chin greyish; chest and belly pure white along medial line, grey laterally; whiskers numerous, long, coarse, black; whisker-like bristles growing from tufts above each eye and on side of cheek. Palm and sole-pads large, rounded, finely striated. Tail thick, tapering, woolly to tip, darker terminally. Ears short, rounded, thick, and fleshy, three projections on inner side. Head and body, 340 mm.; tail, 316 mm.; hind-foot, 48 mm.; ear, 17·3 mm.

Ps. (*Pseudochirops*) *albertisi coronatus*, Thomas. Arfak Mountains, North-west New Guinea. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 144.

Similar to typical form, but fur much longer; hairs of back 30–35 mm. in length. Coloration deeper, richer, more coppery; brown of hands, feet, tail deepening to shining black; dorsal line extending on crown, where it bifurcates and forms cross; lighter mesial patch little defined and strongly suffused with fulvous brown. Head and body, *250 mm.; tail, 220 mm.*

Ps. (*Pseudochirops*) *cupreus*, Thomas. Owen Stanley Range, New Guinea. *Ann. Mus. Civ. Genova*, (2) xviii, 1897, p. 144.

General colour uniform coppery, very similar to *Ps. a. coronatus*; dorsal streak, although distinct, not strongly marked, not reaching forward on crown, and soon ending posteriorly; under surface with irregular patches of white on chest and on inguinal region; belly dull buffy grey; limbs darkening terminally; hands and feet black. Ears with marginal part of inner, as well as whole of outer, surface well clothed with woolly hairs, among them few longer black bristles. Tail at base thickly haired, terminally very thinly haired, becoming practically naked at tip; hairs black; naked part coarsely shagreened. Head and body, 425 mm.; tail, 330 mm.

SCHULTZ'S RING-TAIL OPOSSUM

Ps. (*Pseudochirops*) *schultzei*, Matschie. Dutch New Guinea. *Sitz. Ges. Nat. Fr.*, Berlin, 1915, 4, p. 85.

Form and general colour similar to *Ps. albertisi*; much shorter tail; sharply defined dorsal band, 5·8 mm. in diameter, extending from base of tail to between eyes; length of ordinary hairs of back 30–35 mm. and of longer bristles 40–45 mm.; base of tail dark brown, tip black; feet same colour as back, narrow black band across base of claws; outer edge of ears bright isabelline; breast white; chin and belly mingled white and grey brown; white middle band runs from chest into belly colouring. Head and body, 325 mm.; tail, 225 mm.; hind-foot, 42 mm.

Sub-genus Pseudochirulus, Matschie

Form slender, graceful. Dark line on back, if present, ill defined. Ears small, rounded, broader than long. Naked part under tail varies in length; tail not strikingly thick at base. Hind-leg less than one-eighth length of body. Head yellowish brown, at least near root of ears.

HOARY RING-TAIL OPOSSUM

Ps. (*Pseudochirulus*) *canescens*, Waterhouse. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 181.

Fur short, close; under fur thick, woolly, brown. General colour above silvery grey; face, cheeks pale brownish yellow; centre of face with sharply marked dark longitudinal line commencing in front of eyes and running down nape on to back, where it broadens into indistinct darker band nearly an inch in breadth; under surface dull yellowish grey. Ears laid forward not reaching half-way to eye; outline nearly circular, interior surface naked; their backs thickly hairy, dark brown, this continued downward on to sides of head as marked black patch, not margined anteriorly by paler spot. Tail evenly tapering, silvery grey basally, becoming black distally. Head and body, 260 mm.; tail, 205 mm.; hind-foot, 32 mm.; ear, 12 mm.

Ps. (*Pseudochirulus*) *avarus*, Thomas. South-west New Guinea. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 329.

Allied to *Ps. canescens*. No dark ear-patch. Fur close, fine; hairs of back 10–11 mm. in length. General colour above smoke-grey, middle line darker and more brownish; under surface ochreous buff; head tawny ochreous, duller above, richest on cheeks; narrow blackish frontal line; forearms, hands, feet, inner sides of legs ochreous. Ears naked internally, well furred, but not tufted externally; backs tawny, with no darkening round bases. Tail greyish basally, getting more brownish terminally; under surface ochreous along middle line of basal half; tip naked below for 2 inches. Head and body, 250 mm.; tail, 210 mm.; hind-foot, 29 mm.; ear, 14 mm.

FORBES' RING-TAIL OPOSSUM

Ps. (*Pseudochirulus*) *forbesi*, Thomas. Papua. *Cat. Mars. and Monot. Brit. Mus.*, p. 183.

Fur short, close, velvety. General colour above dull silvery grey; rufous of crown gradually disappearing on forequarters; indistinct dark band running down centre of posterior back; under surface dull white, bases of hairs slate. Outside of anterior limbs more rufous than posterior; hands and feet nearly white, but backs of metacarpals brown. Ears small, rounded, dull rufous on backs; prominent blackish patch in front of and above them, another below and behind them; between two black marks round posterior bases fur is pale yellowish white, connected below with pale colour of throat; whole region of ears markedly tufted with long, fine hairs. Tail evenly tapering, becoming black distally. Head and body, 225–280 mm.; tail, 152–230 mm.; hind-foot, 28–30 mm.; ear, 13 mm.

SCHLEGEL'S RING-TAIL OPOSSUM

Ps. (*Pseudochirulus*) *schlegeli*, Jentink. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 180.

Fur thick, woolly. General colour above silvery grey, with slight rufous tinge; indistinct dark line down centre; under surface pale yellow, tinged rufous; fingers black; feet nearly white; face grey, no darker line in centre. Ears small, rounded; backs thickly hairy, nearly black, except edges, which are rufous, yellowish at base, with indistinct darker posterior mark. Tail evenly tapering, short-haired terminally, naked all round tip. Head and body, 260 mm.; tail, 250 mm.; hind-foot, 30 mm.; ear, 13 mm.

Ps. (*Pseudochirulus*) *caroli*, Thomas. North-west New Guinea. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 357.

General colour above buffy brown; indistinct darker median line from withers to rump; under parts white, hairs creamy white to base; face greyish brown, chin blackish; back of ears and patch in front black, prominent white patch below and behind them; fore-limbs with whole of outer as well as inner sides white in continuation of white of belly; white extending to outer halves of metacarpals; warm brown of body-colour extending down front of forearms in narrow line; proximal half of digits blackish, lighter terminally; behind outer edge of legs and whole of feet white; tail well furred proximally, brown for 3 inches, then darkening nearly to black for next 3 inches, then white. Head and body, 300 mm.; tail, 370 mm.; hind-foot, 45 mm.; ear, 22 mm.

Ps. (*Pseudochirulus*) *barbatus*, Matschie. Saddle Mountain, Gulf of Huon, New Guinea. *Sitz. Ges. Nat. Fr.*, Berlin, 1915, 4, p. 93.

General colour above greyish brown, suffused yellowish; dorsal band indistinct, extending from base of tail to between shoulders; narrow black band on forehead from in front of ears; cheeks, forehead, back of ears ochre-coloured; slight suffusion of ochre on sides of body, nape, and outside of hind-limbs; under surface greyish white on breast, light ashy grey on belly and inside of limbs; fingers pale yellow grey, suffused dark brown; toes pale ochreous grey; greater part of tail chocolate brown, with bronze sheen, darker toward tip.

Ps. (*Pseudochirulus*) *larvatus*, Förster and Rothschild. Rawlinson and Saruwaged Mountains, New Guinea. *Ann. Mag. Nat. Hist.*, (8) vii, 1911, p. 337.

Nearest to *Ps. avarus*. General colour above velvety smoky grey, with ill-defined dorsal line of dark brown expanding into distinct black band over head and face to nose; throat black; black band from throat across cheeks to ears;

smaller one on crown between ears; snout smoky black; face tawny ochreous; forearm washed with same colour on outside; under surface dirty grey, paler in centre; chest and lower throat yellowish white; ears tawny ochreous on outside; tail hairy to tip, black, with few scattered silky grey hairs at base, under side naked as usual. Head and body, 340 mm.; tail, 230–250 mm.; ear, 8 mm.

Ps. (*Pseudochirulus*) *capistratus*, Matschie. Mount Schrader, New Guinea. *Sitz. Ges. Nat. Fr.*, Berlin, 1915, 4, p. 92.

Most closely resembles *Ps. larvatus.* General colour above isabelline grey, with no markings except indistinct line from nape, across head, down nose; hairs of lower back grey at base, then isabelline, with black tip; lighter parts of head and cheeks bright isabelline; dark band from corners of mouth across cheeks, ending 10 mm. behind ears; small band extending to eye; under surface yellowish white; ears coloured like back of head; tail haired to tip, coloured like back for third of length, then blackish, under parts lighter, with tip bare as usual. Head and body (immature), 165 mm.; tail, 135 mm.; hind-foot, 27 mm.; ear, 9 mm.

Ps. (*Pseudochirulus*) *gyrator*, Thomas. Gira River, New Guinea. *Ann. Mag. Nat. Hist.*, (7) xiv, 1904, p. 401.

General colour above greyish; head, arms from elbow, hands, feet buffy; under surface buff, indistinct patch on throat whiter; frontal line black, sharply defined, extending from and in front of corners of eyes to between ears, fading off on nape and back into vague darker dorsal area, rather more than inch in width; back of ears and patch below and behind them blackish brown; tail broad proximally, evenly tapering, brownish grey like body for two-thirds of length, then darkening to blackish brown, below middle line well haired, bright orange patch on basal half, whitish and more thinly haired on third part of length, and quite naked for about 35 mm. at tip. Head and body, 240 mm.; tail, 175 mm.; hind-foot, 30 mm.; ear, 11 mm.

Sub-genus Hemibelideus, Collett

This sub-genus shows some characters of the typical ring-tail opossums, the large flying phalanger (*Petauroides*), and the large opossums of the genus *Trichosurus*. In the live animal the late Robert Grant noted an indication of a flying membrane. The tail is cylindrical, evenly bushy, and the naked part short.

LEMUR-LIKE RING-TAIL OPOSSUM

Ps. (*Hemibelideus*) *lemuroides*, Collett. North-east Central Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 170.

Fur soft, woolly, even on hands and feet. General colour of head and back blackish or brownish grey, grizzled reddish brown on shoulders, ashy brown on hips ; head dark brown, tinge of rufous ; centre of nape and neck with indistinct darker line ; under surfaces yellowish grey ; limbs dark brown, gradually becoming black terminally. Ears projecting little beyond thick fur of head, thinly hairy. Tail shorter than the head and body, black, thickly clothed with fur for whole length above, slightly tapering ; naked part of tail less than length of head. Head and body, 370 mm. ; tail, 295 mm. ; ear, 20 mm.

FAWN RING-TAIL OPOSSUM

Ps. (*Hemibelideus*) *cervinus*, Longman. Atherton Tableland, Queensland. *Mem. Qld. Mus.*, iii, 1915, p. 22.

Form and dimensions similar to *Ps.* (*H.*) *lemuroides* ; but tail longer, equal to length of head and body. Fur long, fine, soft, silky, nowhere adpressed, even sparsely covering dorsal surface of fingers. General colour above, on limbs, and below fawn ; lumbar region and head lighter ; proximal part of hairs silver grey, distal part glossy. Ears long-haired on posterior surface, not projecting much beyond fur.

The late C. M. Hoy, when collecting in the Atherton district, secured some *Ps. lemuroides*, both blackish and fawn, which suggests that this form is a colour variation.

SCALY-TAILED OPOSSUM

Genus Wyulda, Alexander

The one representative of this genus is a curious little phalanger found in North-west Australia, and characterized by having a scaly tail. It has so far been located only in the Violet River valley, inland from Wyndham. It is reported to live among the rocks in granite country, and to be very active and difficult to capture without traps. It is also said to feed principally on the fruit of a species of *Macrozamia*.

SCALY-TAILED OPOSSUM

Wyulda squamicaudata, Alexander. Wyndham district, North-west Australia. *Journ. Roy. Soc. West Aust.*, iv, 1917–18, p. 31.

Fur close. General colour above grizzled, owing to shorter hairs being grey, while longer ones have black tips ; on outer surface of limbs colour more sandy ; hair on toes tawny ; under surface yellowish. Ears little longer than broad, rounded at tips, with few hairs inside and light covering outside. Nose almost naked. Palms and soles naked. Pads large. Tail prehensile, covered with scanty hair for about one-seventh of length, remainder destitute of hair, but covered by small, thick, separate scales, which do not overlap, roughly oval, bluntly pointed posteriorly, dark brown on proximal two-thirds, yellowish on distal third ; naked skin between yellowish. Head and body, 420 mm. ; tail, 305 mm. ; hind-foot, 45 mm. ; ear, 26 mm.

AUSTRALIAN OPOSSUMS

Genus Trichosurus, Lesson

Stout animals. Thick woolly fur. Toes sub-equal, the order of length being 4, 3, 2, 5, 1. Claws large, strong. Soles thickly hairy under heels ; rest naked, with low, rounded, ill-defined pads. Tail strong, well haired, except at under side of tip, which is naked and prehensile. Arboreal.

With a quiet disposition, being by no means active, and with very little means of defence, the opossums are nevertheless the most widely spread of our arboreal animals. They are found in Tasmania, the islands of Bass Straits, and throughout Australia wherever the eucalypts grow. They are equally at home in dense forest, open park-lands, or along winding river-courses of the central districts, where a few gums find a precarious existence.

No Australian animals vary more in colour and size than do the vulpine opossums. The common type is a soft silver grey, with more or less rufous coloration on the forequarters of old males ; in certain parts of Australia the rufous becomes the predominant colour. In Tasmania about 20 per cent. are dark rich brown, and in North-east Queensland there is a bright rufous form with pure white under parts, while in the coastal districts of South-west Australia we find a black type. White animals are not uncommon. These colour varieties will breed true. The dark brown Tasmanian form has been acclimatized in the south of New Zealand, where it seems to have developed a longer and more silky fur. As the animals go northward they become smaller, until the Bathurst Islands variety is only about half the size of that of Tasmania.

The ordinary call of the opossum is a sharp hiss, though it also makes a low, grunting sound.

The food of this species is rather variable. In the main it consist of various species of *Eucalyptus* and *Angophora* ; the animals seem to adapt themselves to certain trees in each district. In Eastern Australia they feed on *E. viminalis*, *E. botriodes*, *E. piperita* ; in the south they are found on *E. rostrata* ; and in the north on *E. citridora.* In Tasmania they have been noted to eat the King William pine, and are especially fond of the peppermint-gum. But they do not confine themselves to the eucalypts ; cultivated gardens are sometimes invaded, and fruit, roses, etc., are taken.

Mr Walter Gill, Conservator of Forests in South Australia, states (*Australian Forestry Journal*, January, 1919) that they destroy young pine-trees (*P. halepensis* and *P. maritima*) by stripping the bark from the leading shoots.

Where suitable food exists the number of opossums per acre will be limited to the shelter available, for unless one can find a hollow to sleep in during the day it will be quickly found by an eagle. Its especial enemy, however, is the great monitor lizard, or goanna, which is able to climb the trees and attack the hapless animal in its retreat. On hearing one of these reptiles climbing the tree the opossum does not attempt to escape, but it does call out, not, it would seem, with a view to intimidating the attacker, but in fear. The aborigines take advantage of this, and ascertain if any given tree contains one of the animals by scratching the trunk with a stick in imitation of the sound of the claws of the lizard; if there, the opossum at once indicates its presence by calling out.

One young is born in May; this is carried in the pouch for two months, then for some time on the parent's back, and is ready for an independent existence about the end of the year.

The dog-eared or mountain opossum is confined to the mountain ranges of Eastern Australia, and then only to the mountain-ash country. These trees do not have many hollows, and the animals often have to take cover in logs and holes in the ground; consequently they are more exposed to danger, and they are usually not so numerous as the silver-greys.

The typical variety of the mountain opossum has a beautiful, dense blackish-grey fur, the finest fur among Australian animals, with the exception of the black Tasmanian opossum, the dark brown type from that island.

In the tropical scrubs of the coast of Northern New South Wales and Southern Queensland a black form is found, which has shorter fur and is somewhat smaller.

The presence of either species of opossum in the bush is indicated by the marks of their claws on the trees; there will often be a well-worn track up the side of a tree in which they live. They are very local, though in dry weather they make to water.

These animals could, in our opinion, be very easily bred for their fur, and much unproductive forest country turned to good account.

The vulpine opossum has been introduced into New Zealand, where it has adapted itself to quite different conditions and food-trees. As there are practically no hollows for it to sleep in, it seems to get along all right in the fork of a tree in the open. According to Professor Kirk (*Report on the Australian Opossum in New Zealand,* 1920) it feeds on a variety of trees, including the wineberry (*A. racemosa*), the karaka (*C. lævigata*), species of fuchsia and pittosporum, and the fruits of many native trees.

Although opossums were blamed for damage to forest trees, careful examination did not confirm this. Mr L. O. Tripp, in a report to the Government, states: " The damage to New Zealand forests is negligible, and is far outweighed by the advantage that already accrues to the community—and that advantage might be made enormously greater by the sale of skins." He concludes with the remark: " Opossums may, in my opinion, be liberated with advantage in all districts except where the forest is fringed with orchards or has plantations in the neighbourhood."

Both species do well in captivity, taking practically any food that is offered, including a wide variety of leaves and vegetables. They are pugnacious, and two males cannot be kept together, though one male will live with several females. They must not be exposed to strong light, too much of which gradually kills all Australian nocturnal animals.

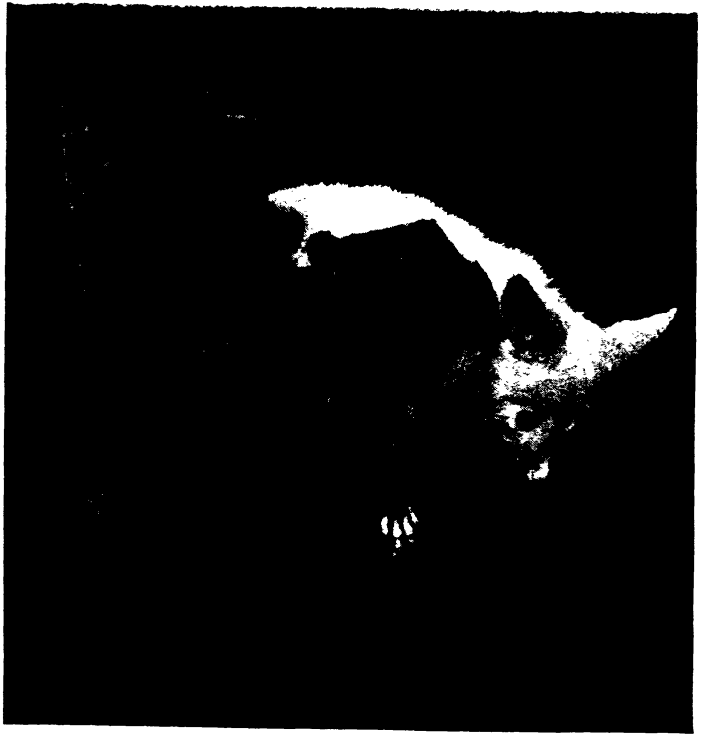
SILVER-GREY OR LONG-EARED OPOSSUM

Trichosurus vulpecula, Kerr. Australia, Tasmania, islands of Bass Strait, Melville Island, Bathurst Islands, introduced into New Zealand. *Cat. Mars. and Monot. Brit. Mus.,* p. 188.

Normal type: General colour above grey, sometimes, especially in old males, suffused rufous on nape and shoulders; under parts more or less white or yellowish, with dark mark in centre of chest; face pale grey, with darker colouring round eyes and on sides of snout. Ears long, narrow, tapering

69. Silver-grey or Long-eared Opossum (*Trichosurus vulpecula*), Brown Type

70. Silver-grey or Long-eared Opossum (*Trichosurus vulpecula*), Normal Type



71. Silver-grey or Long-eared Opossum (*Trichosurus vulpecula*), White Type

72. Silver-grey or Long-eared Opossum (*Trichosurus vulpecula*), Type found on Coast of Northern Australia

toward tip, nearly naked inside and terminally outside, proximal portion outside brown, white mark on posterior base. Tail thick, cylindrical, bushy, grey to half length, black terminally, tip sometimes white, under side of tip naked, transversely wrinkled. Head and body, 320–580 mm.; tail, 240–350 mm.; hind-foot, 48–65 mm.; ear, 35–49 mm. Bathurst Islands animals smaller. (See Fig. 70.)

Brown type: Tasmania, North and Central New South Wales. General colour all over deep rich brown; under fur lighter; long hairs black; white mark behind ears; white tip to tail may be present. (See Fig. 69.)

Red type: North Queensland, dense bush. General colour bright rufous; under parts same colour or pure white; tip of tail and spot behind ear may be white.

Black type: Colley district, Western Australia. General colour above more or less black; under sides white; colour of back due to long hairs covering woolly under fur being very numerous and shining black; white marks behind ear and on tip of tail generally present.

General: White or cream-coloured animals fairly common, but not limited to any one district; every gradation between these types appears; animals from Northern Australia often have terminal part of tail bare. (See Figs. 71 and 72.)

Several of these forms, which are based only on colour, size, or geographical range, have been allotted sub-specific names—*i.e.*, *T. v. arnhemensis* (Collett), from the Northern Territory (*Proc. Zool. Soc.*, 1897, p. 328); also *T. v. eburacensis* (Lönnberg), from Cape York Peninsula (*K. Svenska Vetak. Handl.*, 52, 2, 1916, p. 9), and *T. v. fuliginosus* (Ogilby), from Tasmania (*Cat. Mars. and Monot. Brit. Mus.*, p. 190).

SHORT-EARED OR MOUNTAIN OPOSSUM

Trichosurus caninus caninus, Ogilby. Highlands of Eastern Australia (Victoria to South Queensland). *Cat. Mars. and Monot. Brit. Mus.*, p. 191.

Fur comparatively short, dense. General colour blackish grey; under fur clear grey; longer hairs black; darker on posterior part of back, lighter on forequarters, sides, and under parts. Ears short, rounded, not as long as broad. Tail thick, bushy, nearly wholly black, under part of tip bare, transversely wrinkled. Head and body, 500–570 mm.; tail, 340–380 mm.; hind-foot, 68–75 mm.; ear, 20–27 mm. (See Fig. 75.)

BLACK SHORT-EARED OPOSSUM

Trichosurus caninus nigrans, Le Souef. Coastal scrubs of Northern New South Wales and Southern Queensland. *Aust. Zool.*, i, 3, 1916, p. 64.

Fur shorter, less dense. General colour deep black all over, sometimes more or less suffused umber brown in summer; under parts may be whitish or black. Average size smaller than typical species. (See Figs. 73 and 74.)

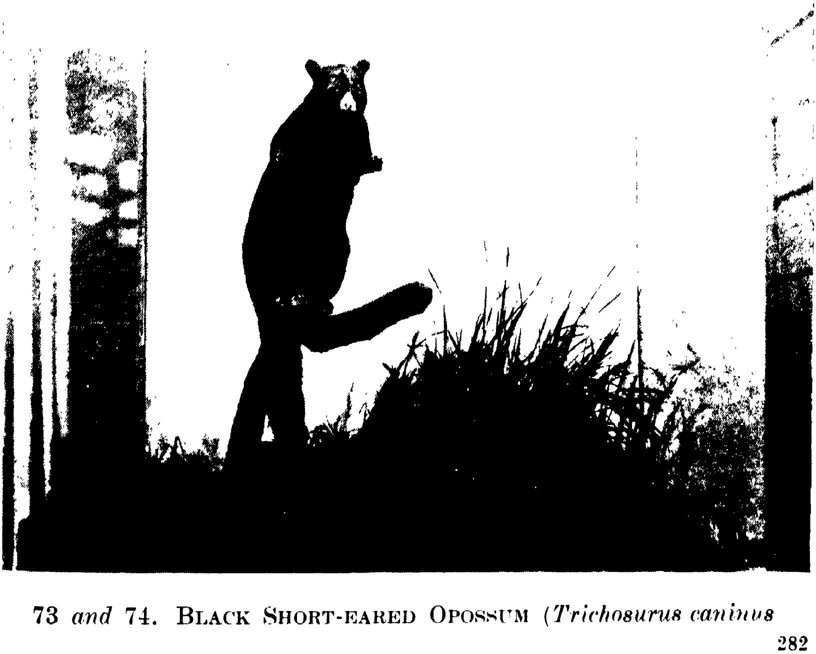
CUSCUS

Genus Phalanger, Storr

Fur thick, woolly. Ears medium or short. Fore-toes sub-equal, lengths in following order: 4, 3, 5, 2, 1. Claws long, stout, curved. Soles naked, striated. Pads large, ill defined. Tail strong, terminal portion naked all round, smooth or granulated, prehensile.

These animals form a well-defined group, living in the heavy tropical scrubs extending from Cape York throughout New Guinea, Celebes, Timor, and many of the Pacific islands. They are slow-moving and sluggish, rather resembling the loris and the sloth in this respect; they live during the day curled up in the thick foliage, coming out at night to feed. They are said to exude a rather strong odour. They have not proved easy to keep in captivity, probably requiring some particular plant to keep them in health.

Wallace, in his *Malay Archipelago*, gives the following note regarding these curious animals: "They live in trees, moving about slowly, and are difficult to kill, owing to the thickness of the fur and their tenacity of life. A heavy charge of shot will often lodge in the skin and do no harm.



73 *and* 74. BLACK SHORT-EARED OPOSSUM (*Trichosurus caninus*

75. Short-eared or Mountain Opossum (*Trichosurus caninus caninus*)

76. Spotted Cuscus (*Phalanger maculatus maculatus*), Male

There is no doubt that their dense woolly fur protects them from birds of prey. The natives catch them by climbing."

Key to Species of Phalanger

A. Ears furred on both sides	
Body showing no spots or dorsal line	
General colour dark brown or black .	*Ph. ursinus*
General colour grey or hoary . .	*Ph. melanotis*
Body usually spotted. No dorsal line	
Colour usually white, spotted or blotched with brown, but showing wide variation. Head and body, about 620 mm.	*Ph. maculatus maculatus*
Similar, but with less variation. Head and body, 310–490 mm. . .	*Ph. m. minor*
B. Ears nearly or quite naked inside	
Body more or less spotted. Dorsal line usually present	
Back more or less spotted. Dorsal line distinct. Old males becoming brilliant rufous on forequarters, neck, and belly	*Ph. ornatus*
Males not rufous on under sides, belly mottled	*Ph. lullulæ*
Yellow spot on outer base of ear only. Line on crown and withers . .	*Ph. rothschildi*
Body showing no spotting. Dorsal line usually present	
Body usually grey, but may vary from dark greyish brown to nearly white. Dorsal line distinct	*Ph. orientalis orientalis*
Male pale brownish above, under surface greyish brown. Female cinereous grey. Dorsal line present	*Ph. o. meeki*
Similar, but with different skull characters	*Ph. o. intercastellanus*
Similar, but with different skull characters	*Ph. o. kiriwinæ*

Intermediate between *Ph. orientalis* and *Ph. breviceps*	*Ph. o. ducatoris*
Smaller form of *Ph. orientalis*	*Ph. o. mimicus*
Similar to *Ph. orientalis*, but dorsal line not so constant. Dark umber brown form on Rubiana and Guadalcanar	*Ph. breviceps*
Body above chocolate brown; under surface white. Dorsal line not defined	*Ph. carmelitæ*
Similar, but with more definite dorsal line	*Ph. coccygis*
Body above dark cinereous grey; limbs, belly, furry part of tail greyish brown; throat whitish	*Ph. leucippus*
Similar, but with longer and more silky hair. No dorsal stripe	*Ph. sericeus*
Body grey, tinged with coppery colour; under sides white or yellowish white. No dorsal stripe	*Ph. celebensis*

Celebean Black Cuscus

Phalanger ursinus, Temminck. Celebes. *Cat. Mars. and Monot. Brit. Mus.*, p. 195.

Fur coarse, harsh. Rhinarium naked, naked part running upward and backward in wedge-shaped form on top of muzzle almost to anterior canthus of eye. General colour dark brown or black; face blackish; tips of hairs, especially on cheeks and snout, dirty white; whitish patch round eyes; hair of sides, posterior back, hairy part of tail grizzled dirty white; chin, chest, and belly greyish, hairs black basally, yellowish white terminally. Arms and legs black. Ears rounded, projecting little beyond fur, thickly covered with short, coarse hairs, inside yellowish white, outside black. Fingers and toes naked above, hairs of limbs ceasing generally on metacarpus or metatarsus, their skin black, coarsely granulated; palms and soles broadly striated. Head and body, 650 mm.; tail, 525 mm.; hind-foot, 104 mm.; ear, 18 mm.

SILVERY-BLACK CUSCUS

Phalanger melanotis, Thomas. Talaut Island. *Nov. Zool.*, v, 1898, p. 2.

Closely allied to *Ph. ursinus*, but smaller, shorter-tailed, different in colour. Fur thick, close, not mixed with longer black hairs. General colour silvery or hoary, becoming pale yellow on hands, feet, and furry part of tail; hoary tone is obtained by silvery rings on hairs partly hiding black of basal part; under surface pale yellowish. Hairs of head directed forward on crown. Ears short, buried in fur, black of backs more developed and yellow of inner surface less developed than in *Ph. ursinus*. Head and body, 450 mm.; tail, 335 mm.

SPOTTED CUSCUS

Phalanger maculatus maculatus, Geoffroy. North Australia, New Guinea, northward to Saleyer. *Cat. Mars. and Monot. Brit. Mus.*, p. 197.

Male: Fur thick, soft, woolly. General colour mottled white, black, and red in various combinations, gradually passing into white on belly; the colouring may vary from grey, with few inconspicuous white spots on back and sides, to nearly wholly white with few black spots; or whole of darker marked parts of animal may be deep rufous. Tail furry, like body, from one-half to three-fourths of length above and from one-third to one-half below; general colour deep yellow. Top of muzzle above rhinarium thinly haired. Ears thickly covered inside and out with soft, woolly hairs. Head and body, 620 mm.; tail, 480 mm.; hind-foot, 71 mm.; ear, 12 mm. (See Fig. 76.)

Female: General colour grey and black; belly white, generally tinged with yellow or rufous, sharply defined from dark-coloured flanks, especially on sides of pouch, where sharp black line runs along edge of darker colour; colour may be more or less rufous. Females from island of Waigiu are exactly like the strongly spotted and generally variable males found on same island. Head and body, 650 mm.; tail, 470 mm.; hind-foot, 70 mm.; ear, 13 mm.

LESSER SPOTTED CUSCUS

Phalanger maculatus minor, Matschie. Manus Island, Admiralty group. *Zool. Ang.*, xliv, 1914, p. 511.

General colour above white with varied-sized reddish-brown spots, the spots being darker in colour on the lower flanks; legs dark brown with a little white showing; face light brown; throat and under surface white, the latter having a few small dark brown spots; tail rusty brown. Some specimens may be silver grey, covered with small dark spots. Head and body, 410–490 mm.; tail, 350–490 mm.

This species does not vary to any marked extent.

ORNATE CUSCUS

Phalanger ornatus, Gray. Morty, Ternate, Batchian, Gilolo group of islands. *Cat. Mars. and Monot. Brit. Mus.*, p. 205.

Male: Fur close, short. General colour grey, spotted with white; orange rufous anteriorly, this colour sometimes spreading over whole of head and neck; black dorsal streak distinct and well defined; chin almost naked, greyish; chest and belly bright orange, mesial white stripe often present. Muzzle naked along top nearly to eyes. Ears short, naked interiorly. Head and body, 410–550 mm.; tail, 330–375 mm.; hind-foot, 43–47 mm.; ear, 15–20 mm.

Female: General colour grey, spotted white; chest, belly white, becoming greyer round pouch. Females smaller than males.

Phalanger lullulæ, Thomas. Woodlark Island. *Nov. Zool.*, iii, 1896, p. 528.

Small cuscus of the *Ph. ornatus* group, spotted with white as in *Ph. ornatus*, but without rufous on forequarters or belly. Fur very close and woolly. General colour above dull brown, irregularly mottled with spots of yellow or white, with increase in number on sides and belly, so latter may be said to be white mottled with brown; chest and inner sides of limbs more white; in female dark colour predominates on lower part of belly and inner sides of limbs; dark dorsal streak present, but very irregular, darkest on crown. Mammæ, 4. Head and body, 375 mm.; tail, 275 mm.; hind-foot, 51 mm.; ear, 21·5 mm.

MOLUCCAN CUSCUS

Phalanger rothschildi, Thomas. Loiwuj, Great Obi, Moluccas. *Nov. Zool.*, v, 1898, p. 433.

Most nearly allied to *Ph. ornatus*. Fur soft, close. General colour uniform dark brown golden fulvous; no white spotting; dorsal line distinct on crown, more or less obsolete on nape, reappearing on withers, disappearing again on posterior back; spot on outer base of ears dull yellow; all under surface and inner sides of limbs pure, sharply defined white, hairs white to bases; middle line of tail below whitish. Head and body, 370 mm.; tail, 310 mm.

GREY CUSCUS

Phalanger orientalis orientalis, Pallas. Timor, Bouru, Sula, Guebeh, and the islands eastward to New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 201.

Male: Fur soft, woolly, extremely variable in length. General colour grey, varying from nearly white to dark greyish brown; albinos not uncommon; upper surface, outside of limbs, head uniform in tint; under surface ordinarily pale grey or white; throat and neck may be suffused yellow or rufous in breeding season. Muzzle naked along upper surface for about half distance to eyes. Ears small, rounded, naked inside and along margins, outside furry.

Female: Usually darker in colour; no rufous suffusion on throat and neck. Usually smaller than male. Head and body, 525–550 mm.; tail, 400–425 mm.; hind-foot, 62–64 mm.; ear, 15–22 mm.

LOUISIADE CUSCUS

Phalanger orientalis meeki, Thomas. St Aignan's Island, Louisiade Archipelago. *Nov. Zool.*, v, 1898, p. 434.

Male: Pale brownish; longer hairs whitish from basal, black from terminal, halves; woolly fur dull white basally, gradually becoming brown terminally; dorsal line present; under surface dull greyish brown.

Female: Dark, wavy, cinereous grey; belly dull greyish, paler and less brown than in male, but without conspicuous colour contrasts. Head and body, 415 mm.; tail, 297 mm.; hind-foot, 59 mm.; ear, 18 mm.

Phalanger orientalis intercastellanus, Thomas. Ferguson Island, D'Entrecasteaux group. *Nov. Zool.*, ii, 1895, p. 165.

Colour of fur grey; dorsal streak present. Lower jaw and structure of supraorbital region as in *Ph. o. orientalis.* Head and body, 420 mm.; tail, 290 mm.; hind-foot, 56 mm.; ear-back, 17·5 mm.

Phalanger orientalis kiriwinæ, Thomas. Kiriwini Island, Brobuand group. *Nov. Zool.*, iii, 1896, p. 528.

Closely allied to *Ph. o. intercastellanus*, but rather larger, and with different structure in supraorbital region. Female pale silvery grey above; under parts little paler; dorsal line strongly marked with yellowish suffusion on fore-back and also on rump just at root of tail; old males lighter, almost white, with under side of neck suffused with rufous brown.

Phalanger orientalis ducatoris, Thomas. Duke of York Island. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 680.

This sub-species is intermediate in size between *Ph. o. orientalis* and *Ph. breviceps.* Head and body, 520 mm.; hind-foot, 62 mm. Described from one female only.

Phalanger orientalis mimicus, Thomas. Coastal region south of Nassau Range, New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 680.

This sub-species is a smaller form of *Ph. o. orientalis.* Head and body, 400 mm.; hind-foot, 55 mm.

SHORT-HEADED CUSCUS

Phalanger breviceps, Lesson and Garnot. Solomon Islands east to San Cristoval. *Cat. Mars. and Monot. Brit. Mus.*, p. 204.

Smaller than *Ph. orientalis*, colour usually similar, but slightly darker, and dorsal stripe not quite so constant in its presence in individuals from islands of Rubiana and Guadalcanar, where a dark umber-brown race lives side by side with a grey one; the stripe is invisible in the umber-brown form. Head and body, 360–480 mm.; tail, 240–330 mm.; hind-foot, 50–52 mm.; ear, 19–20 mm. Female smaller than the male.

Phalanger carmelitæ, Thomas. Mountains of Vanapa River, New Guinea. *Ann. Mus. Civ. Genova*, (2) xix, 1898, p. 5.

Cuscus allied to *Ph. orientalis*. Smaller, differently shaped interorbital region. Colour of male more as in female of that species. Fur thick, normal length. General colour above uniform chocolate brown, darker along middle line of back, but without defined dorsal line; head, ears, arms, legs, sides, chin, furry part of tail all uniform brown; under surface from interramal backward and inner sides of legs and thighs pure, sharply defined white; hairs white to roots. Ears well haired outside practically to margins. Furry part of tail more than half length above. Head and body, 440 mm.; tail, 435 mm.; furry part of tail above, 240 mm.

Phalanger coccygis, Thomas. Saruwaged and Rawlinson Mountains, New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 673.

Nearly allied to *Ph. carmelitæ*, but larger and with more definite dorsal stripe. Upper surface chocolate brown, darker than in *Ph. carmelitæ*, without being the glossy black of *Ph. sericeus*; under surface white, the hairs being white to the roots; black median line perceptible on the fore-back, not strongly defined. Tail with nearly half its length furry. Head and body, 515 mm.; tail, 330 mm.; hind-foot, 51 mm.

Phalanger leucippus, Thomas. Upper Vanapa River, New Guinea. *Ann. Mus. Civ. Genova*, (2) xix, 1898, p. 7.

Allied to *Ph. orientalis*, but with abnormally large premolar teeth. Males coloured as are females of that species. General colour above dark cinereous grey, with wavy appearance; many hairs with silvery sub-terminal band; black dorsal line distinct; limbs, belly, furry part of tail greyish brown, little different from back; throat and chest sharply defined yellowish white, without glandular suffusion. Outer side of ears only partially hairy, terminal third practically naked. Base of tail furry for about one-third length above. Head and body, 480 mm.; tail, 240 mm.; furry part of tail above, 120 mm.

Phalanger sericeus, Thomas. Angabunga River (near the Aroa River), Papua, 6000 feet. *Ann. Mag. Nat. Hist.*, (7) xx, 1907, p. 74.

Size and general characters very much as in *Ph. carmelitæ*, but fur very much longer (hairs of back 38 mm.), exceedingly soft and silky; chocolate brown above; pure, sharply defined white below; median dorsal area blacker than sides; no marked stripe; paler patch just above base of tail. Ears very small, thickly clothed internally, as well as externally, with short brown hairs. Tail as in *Ph. carmelitæ*. Head and body, 455 mm.; tail, 310 mm.; hind-foot, 57 mm.

CELEBEAN GREY CUSCUS

Phalanger celebensis, Gray. Celebes and Sanghir Islands. *Cat. Mars. and Monot. Brit. Mus.*, p. 206.

Fur thick, soft. Colour above uniform grey, tinged coppery; chin, chest, belly white or yellowish white; anal region, under side of tail sometimes deep chestnut. Head and body, 270–390 mm.; tail, 240 mm.; hind-foot, 43–48 mm.; ear, 15–20 mm.

SUB-FAMILY PHASCOLARCTINÆ

Koala, or Native Bear

Genus Phascolarctus

Form very stout, clumsy. Fur thick, woolly. Ears large, thickly furred. Fore-toes sub-equal, lengths being in order 4, 3, 5, 2, 1; first and second toes opposable to others. Palms and soles granulated, without striated pads. Tail rudimentary. Mammæ, 2. Ribs, 11. Arboreal. Herbivorous.

The single species in this genus is the quaint koala, or native bear, a creature which, perhaps, holds the affection of Australians more than any other of their wild animals—a fact for which its innocent, babyish expression and quiet and inoffensive ways are largely responsible. It has been portrayed in caricature and verse, and its hold on the public is used effectively by advertisers.

Arboreal animals are usually light, lithe, and active, but the koala is the very antithesis of this; it may be wondered, indeed, how such a heavy and clumsy animal can get a living among the swaying boughs of the giant eucalypts. But its powerful limbs, armed with stout, sharp claws, enable the koala to take secure hold on the smooth bark. With its hind-limbs directly under its body, and forearms reaching out at an angle of 45°, it proceeds up a trunk in a series of jumps, advancing about four or five inches at each effort.

The koala feeds entirely on the leaves of the eucalyptus, selecting smoothed-barked species with a high oil-content in the foliage. As far as we have been able to ascertain, there are only a few species which form suitable food-trees. On the eastern coast of Australia the 'bear' lives on the spotted gum (*E. punctata*) and the tallow-wood (*E. microcorys*). Farther west it is found on *E. melliodora*, while in Victoria the red gum (*E. rostrata*) and probably the mighty *E. regnans* make a suitable habitat. During the day a koala may be seen curled up asleep in a low fork, but at night it ascends to the highest branches to feed on the tender shoots of the growing tips. When disturbed it will look calmly down without the least fear, but if wounded it will call out piteously, like a hurt child, and fall only when quite paralysed or when life is extinct. It never enters a hollow, and, except in the mating season, it is solitary.

The voice of the koala is very distinctive—it is a hoarse, grating call something like the sound made by a handsaw going through a thin board, only deeper and more intensified. It vies with the voice of the large flying phalanger (*Petauroides*) as being the loudest sound made by a native animal.

Though at one time extremely numerous, the koala is now, over the greater part of its range, very scarce. This is largely due to a disease which swept it off in millions in the years 1887–8–9, and from 1900 to 1903. This disease took the form of ophthalmia and periostitis of the skull. Bears are generally heavily infected with intestinal parasites.

The koala has one young one, about June; this is carried in the pouch for three months, and then on the back until the end of the year, when it is able to shift for itself.

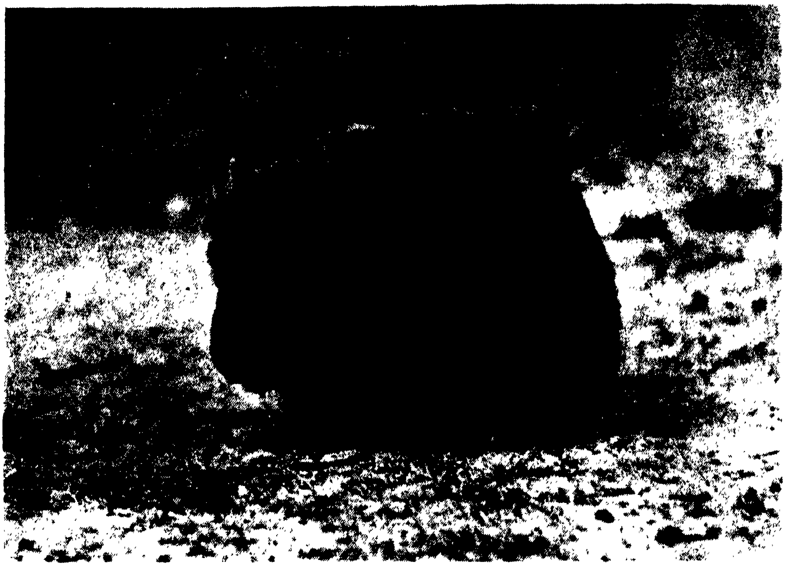
The skin forms a thick, serviceable fur that will stand any amount of hard usage. Only the most callous of shooters, however, can bring themselves to shoot such a childlike animal.

KOALA, OR NATIVE BEAR

Phascolarctus cinereus cinereus, Goldfuss. Eastern Australia, from South Queensland to Southern Victoria. *Cat. Mars. and Monot. Brit. Mus.*, p. 210.

Fur thick, dense, more or less woolly. General colour grey, either light or dark, sometimes mottled, with whitish patches on hindquarters; rump, under parts, hands, feet more or less whitish. Ears large, rounded, short, thickly haired. Tail wanting. Head and body, 700–820 mm.; hind-foot, 130–158 mm.; ear, 56–63 mm. Good deal of variation in length of hair; this is probably seasonal.

77. Koala or Native Bear (*Phascolarctus cinereus adustus*)



78. AUSTRALIAN NAKED-NOSED WOMBAT (*Phascolomys mitchelli*). GREY TYPE

79. WESTERN RABBIT-BANDICOOT (*Thalacomys lagotis*)
See pp. 300–301.

Phascolarctus cinereus adustus, Thomas. North Queensland, extending north to Inkerman. *Ann. Mag. Nat. Hist.*, (9) xi, 1923, p. 246.

Fur shorter. General colour of anterior back more or less strongly suffused with dull rufous or tawny; prominent groin patches rather browner, less rufous. Ears far less thickly hairy, inner surface almost naked, under surface lighter. Head and body, 600 mm. ; ear, 578 mm.; hind-foot, 97 mm. (See Fig. 77.)

FAMILY PHASCOLOMYIDÆ

WOMBATS

Genus Phascolomys, Geoffroy

Wombats have the same characteristic pair of incisor teeth in the lower jaw as have the kangaroos and the phalangers, but they are adapted for burrowing and living some part of their life underground. The body is low and long; the limbs are strong; the forefeet are provided with five toes, each with a strong digging claw; the hind-feet have four toes and a nailless hallux, or big toe, the second and third being somewhat joined together. The tail is very small.

There are 24 teeth, which have a character peculiar to the rodents—that of persistently growing pulps and no roots.

The wombats have rather a wide range over South-eastern Australia, Tasmania, and some of the islands of Bass Strait. There are five species, belonging to two well-marked forms, which occupy different classes of country. The coarse-haired wombats live in the hilly coastal regions, while the soft-haired, hairy-nosed wombat is found in the drier inland areas; it also lives along the coast of the Great Australian Bight, where the dry, sandy nature of the country makes a suitable environment. The wombats from any given district are usually coloured the same. Those from Gippsland are black, from Cooma grey.

The coarse-haired wombats are most at home in the forests, and are well distributed throughout the ranges of Southern Australia and Tasmania. They live during the day in large holes, which they excavate into the side of a hill or bank, and come out during the late afternoon or evening to feed. Quiet, inoffensive, and rather wary, they are seldom seen abroad in daylight, but a dull rainy afternoon will tempt them out earlier than usual. We have noted *Ph. mitchelli* poking about the forest in the Kosciusko district; he appeared to be rather interested in a large patch of snow-grass. On being disturbed no time was lost by the animal in bolting to the cover of an adjacent burrow. These holes are very large, and from 10 to 15 feet in length; at the end there is often a comfortable bark nest. Mr Harry Stein informs us that near an occupied burrow one will often find a shallow excavation at the base of a tree or beside a log facing the morning sun, where the animal can take an occasional sun-bath.

The food of the wombats consists of grass, the inner bark of the roots of certain trees and shrubs, and probably fungi. Mr Ralph Blackett, forestry officer at Queanbeyan, New South Wales, states that they like the roots of *E. regnans*, *E. obliqua*, the native cherry (*Exocarpus*), and the sword-grass (*Xerotes*). Sword-grass, he observes, is used by them as food for the young; they will pull out the stems singly, and drop them on the ground, so that the baby can feed on the tender white base. They also like the roots of thistles, and are fond of a certain puff-ball which they detect and scratch up before it reaches the surface of the ground.

To look at a wombat one would never suspect that such an animal had a sense of humour, but if the confidence of one is gained it may make a delightful pet, and be very playful. In this respect Mr Blackett states: "I was handling a wombat belonging to Mrs O'Connell, of Bullallaba; this was a female six months old. The animal was at liberty and had burrows in the garden, but never attempted to interfere with any of the plants or flowers. It would come to be petted and loved to be nursed just like a baby, yet it was playful, and amused me very much by trying to jump and roll when I was playing with it. It would also suddenly rear upon its hind-legs and try to butt me, just as a goat would do. This animal would follow the kiddies about the paddocks, and when hungry would walk into the house, and make a funny little noise to anyone it could find, until it got something to eat. If taken up to be nursed it quietly shuts its eyes and tries to sleep."

The voice is a hoarse, growling cough, not unlike the noise made by a big kangaroo. Only one young is born at a time; this appears about July, and is ready to leave the parent about the end of the year.

The hairy-nosed wombat has been killed out over a large part of its range. In the Riverina, where at one time it was fairly plentiful, the settlers had to get rid of it as part of the campaign against the rabbits, which pests had a very secure harbour in wombat burrows.

The skin is not put to any commercial use, though the aborigines use the fur of *Ph. latifrons* for making string, coils of which are wound round their hair.

Key to Species of Phascolomys

A.	Nose quite naked, black. Fur coarse and harsh	
	Size large, length 950–1150 mm. Thin under fur	*Ph. mitchelli*
	Size medium, length 910 mm. Thick under fur	*Ph. tasmaniensis*
	Size small, length 675–775 mm. Hair silky appearance	*Ph. ursinus*
B.	Nose hairy, white. Fur soft, silky, grey .	*Ph. latifrons*
	Nose hairy, brown. Fur soft, silky, fawn .	*Ph. gillespiei*

Australian Naked-nosed Wombat

Phascolomys mitchelli, Owen. South-eastern Australia, from Northern New South Wales, through Victoria, to Eastern South Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 212; *Mem. Nat. Mus. Melb.*, No. 3, 1910, p. 57.

Hair rather coarse, shining, with practically no under fur. General colour ranging from fawn grey to black. Ears short, rounded, haired. Rhinarium large, quite naked, more or less pentagonal in shape. Head and body, 950–1105 mm.; hind-foot, 95–105 mm.; ear, 43–48 mm. (See Fig. 78.)

TASMANIAN WOMBAT

Phascolomys tasmaniensis, Spencer and Kershaw. Tasmania. *Mem. Nat. Mus. Melb.*, No. 3, 1910, p. 58.

General colour grizzled grey to black; under fur dark brown, thicker anteriorly; throat, chest lighter coloration. Head and body, 910–950 mm.; hind-foot, 74–80 mm.; ear, 40–50 mm.

FLINDERS ISLAND WOMBAT

Phascolomys ursinus, Shaw. Flinders and Deal Islands, Bass Strait. *Mem. Nat. Mus. Melb.*, No. 3, 1910, p. 57.

Hair silky in appearance, coarse to touch, varying from light sandy brown to blackish, darkest along back. Ears small, erect. Molar bones strongly bowed downward and outward below orbit. Head and body, 675–775 mm.; hind-foot, 65·5 mm.; ear, 57 mm.

SOUTHERN HAIRY-NOSED WOMBAT

Phascolomys latifrons, Owen. South-eastern Australia, west of Dividing Range. *Cat. Mars. and Monot. Brit. Mus.*, p. 217; *Mem. Nat. Mus. Melb.*, No. 3, 1910, p. 58.

Fur soft, silky, mottled grey; chin black; sides of cheeks, throat, chest whitish, as are inner sides of limbs. Ears comparatively long, narrow, pointed, backs thinly clothed with black hairs, inner sides naked; tufts round bases behind white. Spot above and below eye white. Head and body, 870–880 mm.; hind-foot, 90–93 mm.; ear, 66 mm.

QUEENSLAND HAIRY-NOSED WOMBAT

Phascolomys gillespiei, De Vis. Southern Queensland. *Ann. Qld. Mus.*, 5, 1900, p. 14; *Proc. Roy. Soc. Qld.*, xxix, 1917, p. xii.

Grey, mottled black where black bases of hairs show through; washed fawn, especially on rump and back; inner surface of ears, throat, chest, and mammary glands white; middle of chin, outer surface of ears, forearms, feet dark brown; rhinarium brown; broad curved blotch before and spot behind eye black. Head and body, 1020 mm.; ear, 85 mm.

SUB-ORDER POLYPROTODONTIA

Incisor teeth numerous, three or four below and four or five above, small, sub-equal, much exceeded in size by long-pointed canines.

The order Marsupialia is divided into two sub-orders, the Diprotodonts, with two lower incisor teeth (including all the kangaroos, rat-kangaroos, and phalangers, which are, with the exception of some of the small opossum-mice, herbivorous), and the Polyprotodonts, with several lower incisor teeth. These include two important families, the bandicoots and the *Dasyures*, representing the carnivorous and insectivorous side of the order. This sub-order, it is interesting to note, has many representatives in America, as typified by the American opossums, of the family *Didelphyidæ.*

FAMILY PERAMELIDÆ

Many-toothed marsupials, equipped for burrowing and an insectivorous or omnivorous diet. Forefeet with two or three long-clawed fingers, others rudimentary or absent; hind-feet with second and third toes joined, four or five toes very unequal in size; hallux rudimentary or absent; fourth toe large and strong.

The bandicoots form a very compact group, containing nine genera, which, owing to their long hind-legs and prominent middle toe, are often taken to belong to the kangaroo group. From the latter, however, they are definitely separated by the different arrangement of their teeth, by their internal anatomy, and by their habits. They are largely insectivorous, living chiefly on certain white grubs (larvæ of beetles) which they locate by their keen sense of smell and dig up with the long claws of the forefeet, especially adapted for the purpose.

Key to Genera of Peramelidæ

1. Ears long, rabbit-like, laid forward they reach beyond snout. Australia only	*Thalacomys*
2. Ears short, rat-like, laid forward they may reach a little beyond eye	
A. Muzzle long, pig-like, or slender. Tail lightly and evenly haired	
Incisors, $\frac{5}{3}$. Bullæ large, complete, pear-shaped. Australia only, except *moresbyensis*	*Isoodon*
Incisors, $\frac{4}{3}$. Bullæ small, hemispherical, more or less incomplete. New Guinea and islands only	*Echymipera*
Incisors, $\frac{4}{3}$. Bullæ small, somewhat hemispherical, complete. Dutch New Guinea	*Suillomeles*
Incisors, $\frac{4}{3}$. Bullæ as in *Echymipera*. Muzzle abnormally long and slender. Ceram only	*Rhynchomeles*
Incisors, $\frac{4}{3}$. Front of zygomatic arch has deep hollow groove. Back part of edge of upper jaw bow-like. New Guinea	*Anuromeles*
Incisors, $\frac{5}{3}$. Bullæ as in *Echymipera*. Lachrymal bone rounded externally. New Guinea only	*Peroryctes*
Incisors, $\frac{5}{3}$. Bullæ small, hemispherical, complete. Brain-case abnormally short. Lachrymal with small overhanging edge externally. Australia and Tasmania only	*Perameles*
B. Muzzle short, but narrow. Tail crested	
Incisors, $\frac{5}{3}$. Second and third toes alone fully developed. Australia only	*Chœropus*

RABBIT-BANDICOOTS

Genus Thalacomys, Blyth

Muzzle very long, pointed. Ears enormously long, reaching when laid forward beyond snout. Forefeet with three centre digits long, fitted with powerful claws. First and fifth fingers short and rudimentary. Hallux absent; sole hairy, except base of toes, where there are one or two small circular pads. Tail long, crested on upper terminal half.

The rabbit-bandicoots, so called because their long ears resemble somewhat those of a rabbit, have a wide range over inland Australia. They prefer the drier open country some distance from the coast, though in parts of Southern Australia and in the north-west they live close to the sea in semi-arid districts.

Their powerful forearms, fortified with long strong claws, make them expert burrowers, and during the day they live in holes, which they make themselves, in moderately stiff soil. These burrows are single, and can be detected by the piles of loose earth outside the entrance, generally with the distinctive mark of the long hind-foot imprinted thereon. We have noted numbers of these burrows in scrubby sandhills inland from Geraldton, Western Australia, the animals evidently living in company. The species there was *T. lagotis*. On the Nullarbor Plain, in the state of South Australia, occasional holes would be met with, the animals numbering, in 1921, about 21 to the square mile. This species was probably *T. sagitta*, which was known to the natives as the *talgoo*. Farther west they call it the *dalgite*. White men in the bush usually refer to the species as the 'pinkie,' or 'bielby.'

It is very little use trying to dig out a 'bielby' in loose soil, for the bandicoot will excavate ahead of the spade, and the would-be captor will be exhausted sooner than the animal. The natives listen with ear to the ground until they have located the quarry at the end of the hole, and dig in from that point.

During the Horn Expedition to Central Australia Mr

Byrne found a smaller variety, which Professor Sir Baldwin Spencer named *T. minor*. This species is apparently found in the same district as *T. lagotis*; the natives had different names for each, the larger animal being *urgatta* and the smaller one *urpila*. They had different habits. Mr Byrne's note (*Horn Exped. Narr.*, i, p. 110) reads: "Whilst the Urgatta occupies the inner extremity of his burrow, the Urpila during the cold weather lies within a foot or so of the entrance of his, and only uses the inner chamber during the summer. This peculiarity is taken advantage of by the natives, who spring on the surface of the ground, so cutting off his retreat."

The food of the rabbit-bandicoots consists of the large white beetle-larvæ which are found feeding about the roots of various species of acacia and other trees. Near the animals' burrows many excavations will be seen which have been made to obtain this food. The scratching is a cone-shaped hole from four to six inches deep, proportionately larger and deeper than that made by the fasciated bandicoot, often found in the same locality.

These bandicoots are easily kept in captivity. They feed then on raw meat, milk, fruit, and bread, and are especially fond of insects, notably 'bardies,' the white beetle-larvæ.

Key to Species of Thalacomys

A. Body fawn grey. Tail black and white	
Hands white	
Head and body, 400–440 mm.	*T. lagotis*
Head and body, 316 mm.	*T. sagitta*
Head and body, 200–270 mm.	*T. minor*
Hands black	*T. nigripes*
B. Body yellowish fawn. Tail white	*T. leucurus*

WESTERN RABBIT-BANDICOOT

Thalacomys lagotis, Reid. Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 223.

Fur very long, soft, silky, composed almost entirely of under fur. General colour above fawn-grey; under fur slaty grey, paler tips; longer hairs fawn-tipped; sides of rump with indistinct darker band running vertically downward from back, bordered before and behind by white or pale fawn-coloured bands running upward; under surface pure white; face pale brown, under fur white, hairs shorter and stiffer than on body. Rhinarium naked, extending backward for about three-quarters inch along top of muzzle. Ears very long, thinly clothed with fine hairs. Hands and feet white above, black on posterior half. Tail thickly hairy throughout, basal third furred and coloured like body, middle third black or dark brown, terminal third pure white; hairs on upper surface forming prominent crest. Head and body, 400–440 mm.; tail, 205–220 mm.; hind-foot, 98–103 mm.; ear, 90–115 mm. (See Fig. 79.)

CENTRAL AUSTRALIAN RABBIT-BANDICOOT

Thalacomys sagitta, Thomas. Central and South-central Australia. *Ann. Mag. Nat. Hist.*, (7) xvii, 1905, p. 426.

Same characters as in *T. lagotis*, but little paler. Black band on tail slightly shorter; feet paler below, black extending only about third of length beneath heel; white portion of tail longer than black portion. Head and body, 316 mm.; tail, 215 mm.; hind-foot, 91 mm.; ear, 79 mm.

LESSER RABBIT-BANDICOOT

Thalacomys minor, Spencer. East-central Australia. *Proc. Roy. Soc. Vic.*, ix, 1897, p. 6.

Fur very long, soft, silky. General colour above fawn grey, darker than in *T. lagotis*; chin and inner sides of legs white; rest of under sides grey. Nose naked at tip, naked part not prolonged backward. Face brown grey; hands white; hind-feet white above, hairy beneath, hair on posterior two-thirds black, anterior white. Tail with proximal two-thirds short-haired; along dorsal line sharply marked narrow line of dark hairs, increasing distally; posterior dorsal third has white crest. Under surface with few stiff hairs; few whisker-like hairs on posterior side of fore-limbs, just above wrist. Head and body, 200–270 mm.; tail, 118–160 mm.; hind-foot, 57–73 mm.; ear, 68–92 mm.; muzzle to eye, 31–41 mm.

BLACK-FOOTED RABBIT-BANDICOOT

Thalacomys nigripes, Wood Jones. Ooldea, state of South Australia. *Rec. South Aust. Mus.*, ii, 3, 1923, p. 347.

General colour much as in *T. lagotis*, tips of the longer hairs of the posterior end of body being black; at immediate base of tail the black hairs give way to rather bright fawn ones over a distance of about 30 mm.; face fawn-coloured; dorsal area of snout, immediately behind naked portion, and as far back as middle of eye, is black; fine black hairs surround eye; sides of body more fawn-coloured than dorsal surface; chin, throat, and ventral surface pure white; fore-limbs dark on upper and outer aspects, white on inner side and below, proximal portion dark grey, forearms and hands black, digits white, white patch on lower part of forearm; hind-limbs grey on tibial portion, save for a narrow strip of white on the dorsal aspect; feet black; tail black on proximal portion and white on distal two-thirds, the white hairs forming a crest. Head and body, 320–390 mm.; tail, 200–220 mm.; hind-foot, 92–98 mm.; ear, 103–110 mm.

WHITE-TAILED RABBIT-BANDICOOT

Thalacomys leucurus, Thomas. Probably Central or North-west Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 225.

Description taken from young male. General form similar to *T. lagotis*; smaller and different in colour. Fur long, soft, silky. General colour above pale yellowish fawn. Rhinarium naked, confined to extreme tip of snout. Metatragus of ears large, oblong, edges slightly concave, tip broadly rounded, hairy, long secondary lower fold also, with small triangular projection at centre. Under surface pure white; limbs white. Palms hairy on centres, fringed round edges, naked only along under side of toes and on pads, of which there is one single well-defined circular one at base of each of second, third, fourth, fifth fingers, and another below middle phalanx of second, third, fourth. Tail wholly white, short-haired, except long terminal third, above which prominent white crest is formed, some hairs being inch in length. Head and body, 142 mm.; tail, 116 mm.; hind-foot, 50 mm.; ear, 63 mm.

RAT-BANDICOOTS

This group contains a number of closely allied genera and species. The general build is low and rat-like, and the hind-legs not so long as in *Thalacomys.* Ears variable in size, but not so long as to reach, when laid forward, much beyond front of eye; small pouch opening at base of their inner margin, and the lower fourth of their outer margin duplicated, so as to form a second pouch-like hollow between the two portions. Pouch well developed, opening backward and downward. Mammæ, 6 to 8. The long-muzzled group have the naked rhinarium passing down to the lip, and backward for some distance along the top of the muzzle. This group also has the forefeet with the three central toes and claws long; first and fifth digits short, clawless; hallux short, clawless. Soles naked or partially hairy. Tail small, nearly naked. The short-muzzled genus *Chœropus* has the naked rhinarium confined to the extreme tip; forefeet with first and fifth digits suppressed, fourth minute, and only the second and third fully developed. Hind-limbs long, thin; hallux absent; fifth toe short, rudimentary, bulk of the foot made up of the fourth toe; soles hairy; small naked projection at base of fourth toe.

This group constitutes the bandicoots proper, well known all over Australia and New Guinea. They are widely distributed, and occupy all kinds of country.

In Australia there are two well-defined groups. As a rule the comparatively large-bodied, round-eared species occupy the coastal districts, living in rather dense vegetation, while the smaller, pointed-eared forms keep to the more open country, though *P. nasuta* and *P. bougainvillei* are often found near the coast, in open country.

All species of rat-bandicoots have very similar habits. During the day they lie up in a shallow excavation, which is covered with *débris*; this is usually placed at the base of a small bush, and it takes a practised eye to detect the spot. Bandicoots sleep very soundly, and through relying on the protecting covering to screen them from view they can usually be taken from the nest. The aborigines jump on to the 'lie up,' and hold the animal with their feet until it is dispatched.

After dark the bandicoots come out to seek their food, which consists almost entirely of insects and earthworms. With their keen sense of smell they find beetles, larvæ, and earthworms just under the ground, and these their sharp, digging claws soon extract. Where the animals abound their little cone-shaped burrowings will be seen, usually two or three, perhaps four, inches in depth. Occasionally bandicoots will take yams, and they have been blamed for destroying bulbs and root-plants in cultivated gardens, but this belief is usually a mistake, arising from a misconception as to what the animals are seeking.

Bandicoots are able to hold their own pretty well against the inroads of settlement. They make themselves at home in gardens and parks, and there perform a very useful service in keeping down the insect life. The long-nosed bandicoot is particularly numerous around Sydney, and in many of the larger suburban gardens and outlying parks and reserves their scratchings can be seen or their soft gruntings and sharp little cries heard at night; the animals themselves, however, are not seen unless carefully sought, being well hidden away in thick undergrowth.

In captivity bandicoots will eat meat, insects, bread, and milk.

They breed at any time of the year, having usually two or three young at a time; these are carried in the well-developed pouch until able to fend for themselves. When running they use all four feet, and are very fast in spite of their tiny legs. Temperamentally they are nervous and non-aggressive. When disturbed they make a noise like that of a cracked tin whistle, though the normal note of most forms is a soft grunting.

The curious little pig-footed bandicoot is an inhabitant of the drier inland parts of Australia, over which it has a very wide distribution, though it appears to be nowhere abundant. Its habits are similar to those of the genus *Perameles*.

The genera and species included under rat-bandicoots are so closely allied and difficult to separate that we have found it more convenient to group them in one key.

Key to Species of Peramelidæ

(*Excluding Thalacomys*)

A. Centre of sole in adults nearly naked or quite naked to heel. Ears short, when laid forward not or just reaching the eye; tip rounded, not pointed	
a. Sole wrinkled, with distinct pads at base of digits. Metatragus oblong, longer than broad; end twisted. Australia only, except *moresbyensis*	
Rump grizzled yellow uniform with anterior back	*Isoodon obesulus*
Colour paler. Size smaller . . .	*I. nauticus*
Colour above strongly lined black and buff	*I. barrowensis*
Similar to *I. obesulus*, but darker and with shorter tail	*I. macrourus*
Colour above strongly lined fawn and black	
Fawn on sides	*I. auratus*
No fawn on sides	*I. peninsulæ*
Rump grizzled orange	*I. moresbyensis*
*a*¹. Sole finely granulated, with or without indistinct pads. Metatragus small, triangular or rudimentary. New Guinea and islands only	
Tail short, not or scarcely longer than head	
Head and body, 380–450mm.; skull, 73mm.	*Echymipera doreyana*

Head and body, 410 mm.; skull, 83 mm.	*E. gargantua*
Head and body, 270–300 mm..	*E. cockerelli*
Head and body, 130 mm.	*Suillomeles hispida*
Tail appreciably longer than head. Fur crisp, velvety	*Rhynchomeles prattorum*
Tail apparently absent	*Anuromeles rufiventris*
Tail twice length of head	
Distance from nose to eye more than 45 mm.	
Hind-foot more than 65 mm.	
Tail evenly haired	*Peroryctes raffrayanus*
Tail transversely ribbed below, prehensile	*P. broadbenti*
Distance from nose to eye less than 45 mm.	
Hind-foot less than 65 mm.	
Lateral line on face, and line down centre of back	*P. ornatus*
No lateral line on face	*P. dorsalis*
No markings. Colour dull greyish brown	*P. longicaudatus*
No markings. Colour shining rusty brown	*P. rothschildi*
B. Posterior half of sole hairy. Ears long; laid forward they reach beyond the eye; tip pointed. Australia and Tasmania only	
b. Rump not marked	
Tail not crested	*Perameles nasuta*
*b*¹. Rump broadly striped on sides	
Tail dark brown above on basal inch. Tasmania and Victoria	*P. gunni*
Tail dark brown above for whole length. Rump line indistinct, not crossing back. Islands of Sharks Bay, Western Australia, only	*P. bougainvillei*
Similar, but larger. Western Australia	*P. myosura myosura*

Rump lines distinct, crossing back. South Australia	*P. m. notina*
Similar, but muzzle more conical. New South Wales	*P. fasciata*
Rump lines distinct. Orange patch on shoulders. Central Australia	*P. eremiana*
b^2. Rump not marked	
Tail crested	*Chœropus castanotis*

Genus Isoodon, Desmarest

SHORT-NOSED BANDICOOT

Isoodon obesulus, Shaw. Australia, except north and centre, Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 231.

Fur short, coarse, spiny, with spines flattened; scanty under fur slate-coloured, yellowish tips. General colour above coarsely grizzled yellow and black; longer hairs either with yellowish tip and sub-terminal black band or wholly black; under surface white or yellowish white. Ears short, broad, laid forward reaching to within 5 mm. of posterior canthus of eye. Soles with single large smooth pad at base of each of fourth and fifth toes. Mammæ, 8. Head and body, 275–330 mm.; tail, 100–133 mm.; hind-foot, 53–59 mm.; ear, 15–21 mm.; muzzle to eye, 41 mm. (See Figs. 80 and 81.)

NUYTS ISLAND BANDICOOT

Isoodon nauticus, Thomas. Nuyts Archipelago, South Australia. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 678.

Practically same as *I. obesulus*; smaller. Skull of adult male, 55 mm. General colour comparatively pale; under surface white; hands, feet grey brown; metapodials, digits white; tail brown above, whitish below. Head and body, 242 mm.; tail, 103 mm.; hind-foot, 50 mm.

BARROW ISLAND BANDICOOT

Isoodon barrowensis, Thomas. Barrow Island, Western Australia. *Nov. Zool.*, viii, 1901, p. 396.

Small insular form of *I. obesulus*. General colour above strongly lined black and buff; individual hairs grey, basally darkening to black, which latter may be either continued or replaced by buff; under surface dull whitish. Head and body, 270 mm.; tail, 108 mm.; hind-foot, 44 mm.; ear, 22 mm.

NORTH AUSTRALIAN BANDICOOT

Isoodon macrourus, Gould. Northern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 234.

Similar to *I. obesulus*; rather larger, more heavily built, darker in colour, especially on head. Head and body, 335–410 mm.; tail, 180 mm.; hind-foot, 56–70 mm.; ear, 21–22 mm.; muzzle to eye, 36–46 mm.

GOLDEN BANDICOOT

Isoodon auratus, Ramsay. Northern Territory of Australia. *Proc. Linn. Soc. New South Wales*, (2) ii, 1887, p. 551.

Hair coarse, spiny; under fur sparse, very fine, grey. General colour above, including head, coarsely grizzled fawn and black; most of hairs yellowish fawn, others black, or black with light tip; under parts yellowish; broad demarcation line of bright fawn on sides of belly and chest; tail buff above, lighter below. Head and body, 290 mm.; tail, 85 mm.; hind-foot, 48 mm.; ear, 15 mm.; muzzle to eye, 27–31 mm.

CAPE YORK BANDICOOT

Isoodon peninsulæ, Thomas. Cape York Peninsula. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 679.

Similar to *I. auratus*. Light bands on hairs paler, more buffy and less ochreous; sides have not ochreous wash of *I. auratus*; under surface white. Head and body, 308 mm.; tail, 116 mm.; hind-foot, 56 mm.; ear, 31 mm.

SOUTHERN NEW GUINEA BANDICOOT

Isoodon moresbyensis, Ramsay. Papua. *Cat. Mars. and Monot. Brit. Mus.*, p. 235.

General characters as in *I. obesulus* and *I. macrourus*. Fur coarse, spiny. General colour above dark grizzled orange. Head and body, 240–260 mm.; tail, 126 mm.; hind-foot, 55–64 mm.; ear, 17–18 mm.

Genus Echymipera, Lesson

DORIA'S BANDICOOT

Echymipera doreyana, Quoy and Gaimard. New Guinea and neighbouring islands, including Kei and Aru groups. *Cat. Mars. and Monot. Brit. Mus.*, p. 236.

Fur exceedingly coarse, spiny. General colour above dark coppery brown, coarsely grizzled orange, flattened bristles orange, thinner hairs grey, with tips yellow anteriorly, orange posteriorly; top of head dark brown. Muzzle long, narrow; distance from tip of muzzle to anterior canthus of eye considerably exceeding that from latter to ear. Ears small, laid forward not reaching half-way to eye; inner margin evenly convex, outer nearly straight for upper two-thirds, then convex; metatragus about 3 mm. in length, triangular, pointed, tip thinly haired. Under surface variable, either whitish or brown and white or brown and yellow. Hind-feet very variable in size, but generally in male 60 mm. or more and in female 50–60 mm. long. Soles wholly naked, surface without pads, coarsely granulated. Head and body, 380–450 mm.; tail, 83–120 mm.; hind-foot, 56–75 mm.; ear, 23–24 mm.; muzzle to eye, 48–58 mm.

Echymipera gargantua, Thomas. New Guinea and D'Entrecasteaux Islands. *Ann. Mag. Nat. Hist.*, (8) xiii, 1914, p. 443.

Similar to *E. doreyana* in all general characters, but with a much larger skull. Head and body, 410 mm.; hind-foot, 74 mm.; ear, 31 mm. The length of the skull is 73 mm. in the largest *doreyana*, and 83 mm. in the smallest *gargantua*.

COCKERELL'S BANDICOOT

Echymipera cockerelli, Ramsay. North coast of New Guinea, Salawatti, Misori, and Admiralty Islands, and New Britain group. *Cat. Mars. and Monot. Brit. Mus.*, p. 238.

Much smaller, and with shorter muzzle than in *E. doreyana*. Fur same. General colour above coarsely grizzled black and yellow. Muzzle short, broad; distance from nose to anterior canthus of eye less than or barely 40 mm. Face and crown dark brown; sides of face below eyes white. Ears laid forward reach to within 2 or 3 mm. of posterior canthus of eye; metatragus pointed, triangular. Under surface white. Soles naked, no pads, finely granulated. Mammæ, 6. Head and body, 270–300 mm.; tail, 71–85 mm.; hind-foot, 45–52 mm.; ear, 17–18 mm.; muzzle to eye, 32·5–38 mm.

Genus Suillomeles, Allen and Barbour

Suillomeles hispida, Allen and Barbour. Manokwari, Doreh Bay, Dutch New Guinea. *Proc. New England Zool. Club*, iv, 1909, pp. 43–46.

In general appearance this species is very like a small specimen of *I. obesulus*. Body stout. Head nearly one-half length of body in dried skin. Pelage stiff and spiny, with numerous somewhat flattened and coarser hairs on dorsal surface. Ears oval, round tipped. Naked rhinarium extends 8 mm. back from tip of snout, showing a slight median groove distally. Mid-dorsal area shining black; head black and grizzled with tawny; toward the sides of neck and body this colour becomes increasingly prominent, until the sides are clear rich tawny, which shades rather abruptly into the colour of the lower parts, which is bright buff; this colour extends from chin to anus, including the inner sides of thighs and both surfaces of forefeet. The minute hairs of tail and ears are blackish. Head and body, 129 mm.; tail, 33 mm.

Genus Rhynchomeles, Thomas

CERAM ISLAND BANDICOOT

Rhynchomeles prattorum, Thomas. Mountains of Ceram Island. *Ann. Mag. Nat. Hist.*, (9) vi, 1920, p. 430.

Fur crisp, velvety, not spinous; hairs of the back about 14 mm. in length. General colour above uniform dark chocolate brown, bases of the hairs whitish brown; under surface practically the same, with a strongly contrasted white patch, of variable size, on the chest. Muzzle naked both on top and sides. Ears small, oval, brown. Head and forearms rather lighter than the back, a whitish patch sometimes present on the wrist; upper surface of hands nearly naked, a few fine hairs whitish; feet pale brown; tail practically naked, blackish brown. Head and body, 320 mm.; tail, 130 mm.; hind-foot, 65 mm.; ear, 25 mm.

Genus Anuromeles, Heller

Anuromeles rufiventris, Heller. Bongu, New Guinea. *Abh. Mus. Dresden*, vi, 8, 1897, p. 5.

General colour above black and reddish yellow; lower part of body and legs reddish brown; lower half of inside thigh mixed with blackish hair; lower jaw and throat red brown, abdomen not quite so dark; bristles up to 0·7 mm. thick; under hair grey brown, one third of point yellowish brown. Ears elliptical, longer than wide, outside sparingly covered with short blackish and yellow-brown hairs, inside yellow brown only; metatragus short, brown, triangular at point, with a few outstanding reddish hairs. First toe of front foot, without claw, hardly longer than fifth. Sole of hind-foot not hardened, but the same as in young of *E. doreyana*, and provided with a level polygonal cushion. Head and body, 315 mm.; muzzle to eye, 36 mm.; hind-foot (without claw), 49 mm.; ear, 15 mm. Tail absent in type specimen.

Genus Peroryctes, Thomas

RAFFRAY'S BANDICOOT

Peroryctes raffrayanus, Milne-Edwards. Amberbaki, Huon Gulf, and Goldie's River, New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 239.

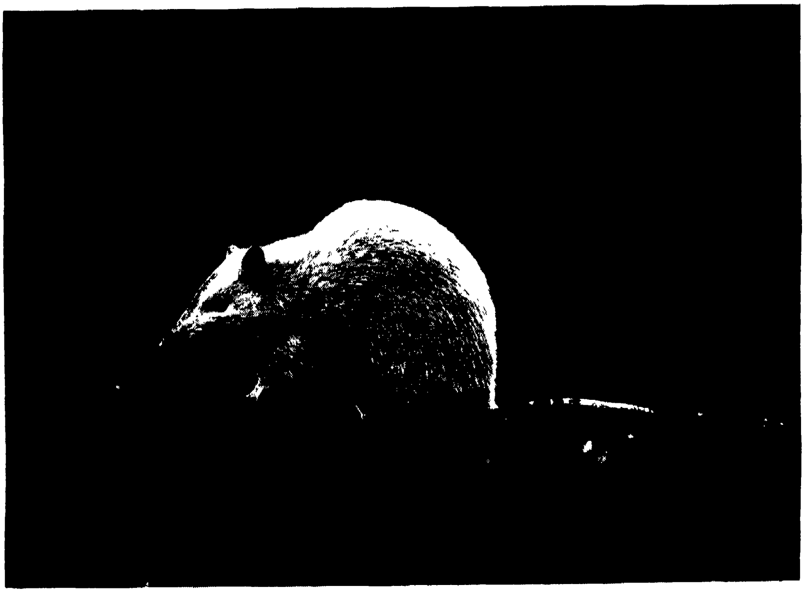
Head long, slender. Fur thick, close, although hispid, slightly spinous locally, but never so spinous as in *I. obesulus* group, rather more than in *P. nasuta.* General colour above coarsely grizzled rufous or umber brown, stiffer hairs black, thinner ones orange or rufous-tipped; head dark brown, sides of face paler. Muzzle very long, slender; top of sides of nose naked. Ears long, narrow, laid forward not quite reaching eye; metatragus little more than single ridge. Chin, chest white, below brown or mixed white and brown. Fingers nearly naked. Hind-soles quite naked, coarsely granulated, indistinct and rudimentary; pads at base of fourth and fifth digits. Tail long, cylindrical, uniformly clothed with short, fine black hairs. Mammæ, 8. Head and body, 330–410 mm.; tail, 172–185 mm.; hind-foot, 74–82 mm.; ear, 25–26 mm.; muzzle to eye, 48–53 mm.

BROADBENT'S BANDICOOT

Peroryctes broadbenti, Ramsay. Goldie's River, New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 240.

Head long, slender. Fur comparatively smooth, longer black hairs stiff, but not spiny, longest about inch in length. General colour above blackish brown; head ashy, pencilled blackish. Ears narrow; metatragus low, not markedly projecting. Throat, sides, and under surface fawn colour. Hands almost naked. Feet roughened below with flattish scales. Tail long, scaly above, covered with transverse flattish scaly tubercles below; blackish above for two-thirds length, then fawn colour to tip. Head and body, 508 mm.; tail, 200 mm.; hind-foot, 98 mm.; ear, 68 mm.; muzzle to eye, 68 mm.

80. SHORT-NOSED BANDICOOT (*Isoodon obesulus*)
See p. 307.



81. SHORT-NOSED BANDICOOT (*Isoodon obesulus*). ALBINO
See p. 307.

82. Long-nosed Bandicoot (*Perameles nasuta*)

83. South Australian Striped Bandicoot (*Perameles myosura notina*)

ORNATE BANDICOOT

Peroryctes ornatus, Thomas. New Guinea. *Proc. Zool. Soc.*, ii, 1903, p. 201.

General characters similar to *P. longicaudatus*. General colour above pale brown; prominent black mesial line running from muzzle to base of tail; black streak from base of whiskers through eye to base of ears; under surface dull creamy whitish; rump with additional black line, parallel to mesial line, running on to back of hind-legs; ears dark brown, with small blackish mark on posterior base. Tail long, finely haired; yellow on terminal two inches and on under side, rest brown. Head and body, 300 mm.; tail, 177 mm.; hind-foot, 59 mm.; ear, 28 mm.

SINGLE-STRIPED BANDICOOT

Peroryctes dorsalis, Thomas. Doormanpad-bivak, New Guinea. *Ann. Mag. Nat. Hist.*, (9) ix, 1922, p. 264.

Like *P. ornatus*, but stripe on head and rump practically confined to the median line. Tail almost completely naked. Head and body, 270 mm.; tail, 185 mm.; hind-foot, 54 mm.

LONG-TAILED BANDICOOT

Peroryctes longicaudatus, Peters and Doria. Arfak Mountains, North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 241.

Fur coarse, close, hispid, but not spiny. General colour above dull greyish brown, stiffer hairs brown, thinner ones tipped dull yellow or grey. Ears laid forward reach to within 7 or 8 mm. of eye; metatragus low, triangular, bluntly pointed. Chin greyish brown; chest and belly white or yellowish. Fingers naked. Soles naked, finely granulated, with minute rudimentary pads at base of digits. Tail long, tapering, thinly haired; terminal two inches and under side white, remainder brown. Mammæ, 6. Head and body, 272 mm.; tail, 197 mm.; hind-foot, 54 mm.; ear, 19 mm.; muzzle to eye, 38 mm.

Rothschild's Bandicoot

Peroryctes rothschildi, Förster. Dutch New Guinea. *Zool. Ang.*, lii, 1913, p. 177.

General colour above shining rusty brown grizzled with blackish, caused by numerous coarse black hairs, about 10 mm. in length, showing through the somewhat shorter and softer rusty or light brown hairs; on the brow there are some silvery hairs, so that this part appears lighter; sides of body reddish grey, passing into grey on under side of legs; under surface pure white; chin slightly reddish, this colour extending to belly behind front legs. Upper part of heel thickly clothed with very short compact grey hairs. Tail nearly naked, being covered with small scales, on which are some short hairs. Head and body, 300 mm.; tail, 140 mm.; hind-foot, 62 mm.

Genus Perameles, Geoffroy

Long-nosed Bandicoot

Perameles nasuta, Geoffroy. Eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 242.

Fur coarse, hispid, slightly spinous; under fur thin, sparse, pale slaty grey. General colour all over dull olivaceous brown. Muzzle very long, slender. Ears long, narrow-pointed, laid forward reaching anterior canthus of eye; metatragus about as long as broad, evenly rounded; back of ears brown, rather darker terminally and paler basally. Under parts whitish. Soles granulated black, thinly haired posteriorly, white and naked anteriorly. Tail brown, paler below. Head and body, 310–425 mm.; tail, 125–165 mm.; hind-foot, 62–73 mm.; ear, 32–43 mm.; muzzle to eye, 57–63 mm. (See Fig. 82.)

Gunn's Striped Bandicoot

Perameles gunni, Gray. Victoria and Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 245.

Fur soft, not spiny, except slightly on sides of body; under fur abundant, dark slaty grey except on white rump-bands. General colour above grizzled yellowish brown;

sides of rump with four more or less distinct vertical bands running downward from near middle line; spaces between them brown or black; under surface white or yellowish white; behind shoulders indistinct whitish band passing downward and backward to join light colour of belly. Ears long, pointed, laid forward reaching beyond eye; backs yellowish brown, with darker blotch on anterior half terminally; metatragus about twice as long as broad, and tufted, with short hairs. Tail slender, thinly haired; upper side dark for basal half, remainder white. Head and body, 380–400 mm.; tail, 80–90 mm.; hind-foot, 70–72 mm.; ear, 31–34 mm.; muzzle to eye, 60–65 mm.; female apparently larger than male.

SHARKS BAY STRIPED BANDICOOT

Perameles bougainvillei, Quoy and Gaimard. Islands of Sharks Bay, Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 246.

Fur coarse, not spiny, except slightly on sides of body; under fur thick, close, slaty grey. General colour above olive grey; sides of rump indistinctly striped with single darker line, bounded by two lighter vertical bands; under surfaces white; outside of forearms and backs of legs dark grey; rest of limbs white. Muzzle long, slender. Ears long, narrow, pointed, laid forward reaching to 8 mm. beyond anterior canthus of eye; backs greyish flesh colour, slightly darker terminally. Soles hairy, black posteriorly, naked, granulated, flesh-coloured anteriorly, well-defined round pads at bases of fourth and fifth toes. Tail thick at base, contracting abruptly at middle; brown above, white below. Mammæ, 8. Head and body, 216–222 mm.; tail, 106–108 mm.; hind-foot, 52 mm.; ear, 34 mm.; muzzle to eye, 40–42 mm.

WEST AUSTRALIAN STRIPED BANDICOOT

Perameles myosura myosura, Wagner. Western Australia. *Ann. Mag. Nat. Hist.*, (9) x, 1922, p. 144.

Similar to *P. bougainvillei*, but a little larger. Dark line comparatively indistinct, not crossing the back.

South Australian Striped Bandicoot

Perameles myosura notina, Thomas. South Australia. *Ann. Mag. Nat. Hist.*, (9) x, 1922, p. 144.

External characters almost exactly as in description of *P. fasciata* in British Museum catalogue, but skull as in *P. m. myosura*, with a more slender muzzle and smaller teeth. Head and body, 280 mm. ; tail, 90 mm. ; hind-foot, 56 mm. (See Fig. 83.)

New South Wales Striped Bandicoot

Perameles fasciata, Gray. New South Wales. *Cat. Mars. and Monot. Brit. Mus.*, p. 248.

Similar to *P. bougainvillei*, except that dark and light patches on ears are more strongly marked, and stripes on rump more conspicuous, and arranged as in *P. gunni*; measurements as in *P. bougainvillei.* Teeth larger and heavier, and muzzle more conical than in *P. myosura.*

Central Australian Bandicoot

Perameles eremiana, Spencer. Central Australia. *Proc. Roy. Soc. Vic.*, ix, 1897, p. 9.

Fur soft, with numerous long, dark, spiny hairs on dorsal surface, continuous with two dark bands down either side of rump. General colour above dull orange ; margins of upper jaw, under surface of head, and whole of under part of body white ; orange patch on shoulders ; patch of dark grey under fur on outer side of arm and forearm ; rest of front limbs white ; orange patch on rump between two lines of long black, spiny hairs where the latter hairs are absent ; patch of grey under fur on outer side of hind-limbs ; under side of hind-limbs and under surface of foot white ; long hairs white at base, flattened parts and tips black ; under fur on back grey basally, with white median part and orange extremity ; on sides of body grey is wanting ; on under surface orange is absent. Ears long, narrow, pointed, laid forward reaching 17 mm. beyond anterior canthus of eye ; grey behind, with brownish patch anteriorly. Few long whisker-like hairs above wrist. Soles of hind-feet covered with dark brown hair up to pads at base of fourth or fifth toe. Tail bicoloured, upper surface dark, white on under side. Head and body, 235–275 mm.; tail, 118–135 mm.; hind-foot, 50·5–55 mm.; ear, 51 mm.; muzzle to eye, 37–38 mm.

PIG-FOOTED BANDICOOT

Genus Chœropus, Ogilby

PIG-FOOTED BANDICOOT

Chœropus castanotis, Ogilby. Inland Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 250.

Fur coarse, straight, not spiny; under fur abundant, slaty grey at base, dull yellow at tip. General colour above uniform coarsely grizzled grey, tinged fawn; under surface white. Ears long, narrow, slightly concave on outer surface just beneath tip; backs chestnut brown, darkening toward tip; metatragus short, broad. Palms wholly hairy, except on terminal pad of two functional digits, which alone are fully developed. Hind-feet very long, thin, hairy except just below the heel, and on small circular pad at base of fourth toe, along under side of that toe, and on under side of terminal pad. Tail grey below and on sides, black above, where there is short crest. Head and body, 250 mm.; tail, 100 mm.; hind-foot, 69 mm.; ear, 52 mm.; muzzle to eye, 39 mm.

FAMILY

SUB-FAMILY DASYURINÆ

These are typical carnivorous marsupials, ranging in size from the large dog-like marsupial wolf to the small pouched mice. The larger species are flesh-eaters, and take the place in Australia of the wolves and foxes in other parts of the world. The smaller animals are chiefly insectivorous, and very much resemble mice in their appearance and habits.

With the exception of some of the phascogales, they are terrestrial and nocturnal, living in holes, logs, caves, etc., during the day, and coming out to feed at night. As a rule they locate their prey by scent and take it by stealth, for the larger species are not at all active when compared with the more advanced animals of prey.

As a family they are remarkably silent. The thylacine and Tasmanian devil have husky, coughing, and snarling notes, which are rather flat and characterless, as are the voices of most of the marsupials. The smaller species seldom utter any sound.

A special character of the family is that they are regardless of danger in the presence of food. Most of them can be taken out of a trap and handled with impunity if they have food in their mouths, and they will feed from the hand as soon as captured. Their sense of life-preservation is, therefore, low as compared with ordinary carnivores.

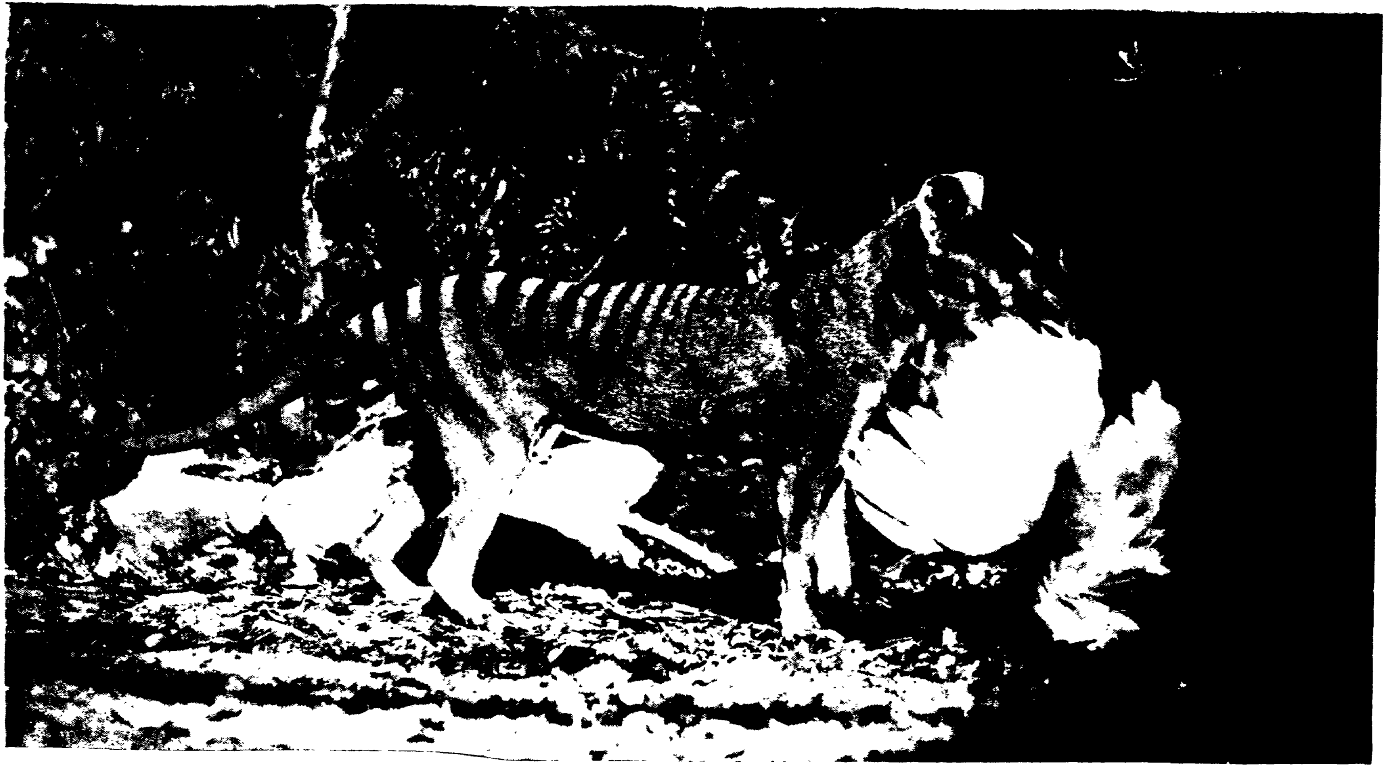
MARSUPIAL WOLF

Genus Thylacinus, Temminck

General build dog-like. Hallux wanting. Pouch opening backward. Mammæ, 4.

Though once found on the mainland, this peculiar dog-like marsupial is now confined to Tasmania, where it chiefly inhabits the hilly forest country, lying up in timber and scrub during the day and coming out to hunt on the edge of the thickets during the later afternoon and evening.

The thylacine hunts singly or in pairs, feeding on wallabies, small rodents, and birds. When a wallaby is put up it is not chased at breakneck speed, after the manner of a dog, but the pursuer merely trots along the scent until the quarry shows signs of exhaustion; it then quickens its pace, rushes in, and secures the victim. The wolf very rarely takes a dead bait, and seldom returns to a carcass. It is by no means fast, and lacks the easy paces of the Canidæ. It usually trots, or, if pressed, breaks into a shambling canter. When excited it makes a series of husky, coughing barks, the breath being indrawn with a wheeze.



84. Marsupial Wolf (*Thylacinus cynocephalus*)

85. Tasmanian Devil (*Sarcophilus harrisi*)

86. Large Spotted-tailed Tiger-cat (*Dasyurus maculatus*)

See pp. 325–326.

Although quiet and inoffensive as far as man is concerned, the thylacine can put up a good fight against a dog, as the following incident, related by Mr Hugh S. Mackay, will illustrate : " A bull-terrier was once set upon a wolf (thylacine) and bailed it up in a niche in some rocks. There the wolf stood, with its back to the wall, turning its head from side to side, checking the terrier as it tried to butt in from alternate and opposite directions. Finally, the dog came in close, and the wolf gave one sharp, fox-like bite, tearing a piece of the dog's skull clean off, and it fell with the brain protruding, dead."

The thylacine usually produces four young. These are carried in the pouch for about three months, and then deposited in a snug shelter until able to take the field on their own account. Mr Finty, of Smithton, Tasmania, states that when he was crossing a creek on a fallen tree a female wolf tried to bar his way, and he had some difficulty in scaring her off. His curiosity being aroused by the daring of the animal, when he reached the opposite bank he searched the bushes and discovered two young wolves secreted in a dry fern-bed under the drooping and still attached dead fronds of a tree-fern. These reached the ground all round the butt, thus forming a natural tent-like shelter and a perfect camouflage for the youngsters.

Adult wolves are difficult to tame, but when caught the young are quiet and tractable, and do well in captivity, provided they are given some small game occasionally, besides a ration of meat.

This animal is now getting rare in Tasmania. The inhabitants seem to have a superstitious dread of the ' hyæna,' as they sometimes call it, and will kill the wolf whenever opportunity offers. Indeed, some will even smash the wolf to pulp afterward, thus depriving science of the skeleton and skin.

MARSUPIAL WOLF

Thylacinus cynocephalus, Harris. Tasmania (fossil on the mainland). *Cat. Mars. and Monot. Brit. Mus.*, p. 255.

Form dog-like. General colour grizzled stone brown, tinged tawny yellow ; across back 16 or 19 blackish-brown stripes; under sides paler than back; whitish marks round eyes and at base of ears. Soles naked, coarsely granulated, without definite pads. Tail tapering, thinly haired, tip blackish, with indistinct crest of longer hairs above and below. Head and body, 1080 mm.; tail, 530 mm.; hind-foot, 150 mm.; ear, 57 mm. (See Fig. 84.)

TASMANIAN DEVIL

Genus Sarcophilus, Cuvier

Thickset, powerful animal, about size of cat. Short muzzle. Thick neck. Metatragus as in *Dasyurus*. Feet plantigrade. Carnivorous. Terrestrial.

Like the thylacine, this species was once found on the mainland, and seems to have become extinct from the same cause, probably the introduction of the dingo. It is now confined to Tasmania, where it is rather numerous, being found in all kinds of country that afford it food and cover.

This animal is very like a raccoon in its habits, and though not active it makes up for this by its strength and cunning, which enable it to pull down comparatively large animals. But its usual prey is small wallabies, rat-kangaroos, ground birds, etc., which it locates with its keen sense of smell and captures by surprise. Remains of parrots, quail, and rats have been found in the stomach, and from its habit of searching the banks of streams doubtless frogs are taken. It shows no nicety of taste, and will take any carrion that comes in its way.

During the day it lies in logs or other cover, and hunts in the afternoon and evening, following the wallaby pads and working the cleared patches for any unwary animal or bird. These it must capture by strategy, for its slow, ambling canter will not enable it to overtake anything at all active.

The call is a peculiar whining growl, often followed by a snarling cough. Young devils can climb trees.

As with practically all the marsupials, the mating season is in March and April, and the young are born in May. The late Mrs Mary Roberts has given us a splendid account of the breeding habits of the species, from observations of a pair that she kept in her private garden at Hobart. From this recital we extract the following: " Two devils were kept together as a pair. These showed no disposition to breed until April; then the male would not allow the female to come out of their little den; if she did he would immediately attack and drag her back. When I called it was pitiable to hear her whining, but it was of no avail, for the male was a relentless tyrant, and kept her in seclusion for ten or twelve days. Then, early in May, he allowed her free once more. Thence onward the balance of power was on the side of the female. She constantly resented his approach by biting and snarling, as though she instinctively felt that he might do the young some injury. From now on her pouch was carefully examined every day, but it was some time before I could be sure that it was gradually enlarging. Matters went on much in the same way until late in September, when, to my delight, a tail or part of a small body could be seen sticking out, more especially when the mother sat up to wash her face. Unlike the domestic cat, the devil uses both paws for washing, placing them together, and forming a cup-like depression, which is thoroughly licked and well rubbed over the face.

" At the end of September the mother was noticed to be carrying large bunches of straw in her mouth, evidently seeking a place in which to make a bed for her young. From observations I have come to the conclusion that about four and a half months elapse from the breeding season until the young are able to leave the pouch."

Mrs Roberts found that these animals, reared in captivity, make delightful pets, being frolicsome and affectionate. They are fond of bathing, and also of basking in the sun. Adult animals caught wild are docile when handled.

TASMANIAN DEVIL

Sarcophilus harrisi, Boitard. Tasmania (fossil on the mainland). *Cat. Mars. and Monot. Brit. Mus.*, p. 258.

Form thick, powerful. Fur thick, close, consisting largely of soft, woolly under fur. General colour black, generally white crescent on fore-part of chest; white mark of variable size on shoulders and rump. Ears rounded, hairy, tuft of hairs at base. Tail uniformly thickly haired. Soles naked, coarsely granulated, with broad prominence [not subdivided, and with small transversely striated pad at tip of each toe just beneath claw. Head and body, 471 mm.; tail, 242–261 mm.; hind-foot, 92–96 mm.; ear, 26–36 mm. (measured in the flesh). (See Fig. 85.)

TIGER-CATS AND NATIVE CATS

Genus Dasyurus, Geoffroy

Form very like civet cats. Rhinarium well defined, quite naked, with deep groove running down upper lip. Ears long, narrow, tips well defined, lower half of outer margins only slightly or evenly convex; metatragus broad, folded downward, edges thickened and bent outward before and behind. Pouch formed only in breeding season, opening vertically downward, wall about equal in depth all the way round. Mammæ, 6 to 8. Dentition as in *Sarcophilus*.

This genus contains two types of animals, one form with a spotted tail, containing two species, the large tiger-cat and its small form (*D. gracilis*) from North Queensland, and the native cats, animals without spots on the tail, of which there are several species.

The spotted-tailed dasyure, commonly known in Australia as the tiger-cat, is fairly common in Eastern Australia, from Cape York to Victoria, but appears to be rather more numerous in Tasmania. It is generally found in timbered or rough scrubby country, and at times along the coast-line, more especially in the estuaries. Being a fierce and rather powerful animal, it is able to kill wallabies and fairly large birds, but doubtless its chief food is such small fry as can be taken by surprise in the bush, as, owing to its short legs, it is not at all speedy.

A correspondent living on the Hawkesbury River, New South Wales, relates seeing a tiger-cat carefully stalking a white-fronted heron which was feeding on a mud-flat. The dasyure, keeping low, ran forward when the bird's head was down, and stopped when it was raised. No doubt it would have secured the heron had not a movement of the observer caught its eye, when it ran to cover.

Mr Robinson, of Palotta, Gosford, New South Wales, stated that on two or three occasions his hen-roost was visited by one of these animals during particularly dark rainy nights; on each occasion a number of birds were killed.

The tiger-cat is remarkably secretive and shy, and is very rarely seen. This is just as well, as it is certainly the most combative creature in the Australian bush. One kept two Irish terriers at bay from a vantage recess in a tree, and at Kurnell (near Sydney) one succeeded, after a severe battle, in killing a large tom-cat. When brought to bay or placed in a cage the tiger-cat invariably faces its enemy, sometimes emitting low, snarling growls, and if opportunity offers it will spring and attack with great rapidity.

A specimen we trapped near the Arthur River, Tasmania, being required for museum purposes, had to be shot through the heart, and the observer states: "Now, to induce this vicious animal to stand side on was a ticklish task, for, move as I would, the animal would persist in facing me; so I decided to stand quite still and pretend not to notice him. After some time he tired of swearing at me, and retired to the full length of the chain and stood side on, apparently unconcerned at my presence. I took one step nearer to make certain of my aim, but the instant I fired the revolver the dasyure fastened his teeth in the thumb and fingers of my left hand, and like a flash let go again and was back to his previous position. The weight of the trap and chain did not appear to impede his movements."

The tiger-cat shows strongly the characteristic trait of the dasyures of indifference to enemies in the presence of food, as the following incident will show: A farmer on the Arthur River came upon a tiger-cat in broad daylight, feeding on the remains of a wallaby. He made a hit at it with an axe he was carrying. The animal jumped clear, and remained a few yards away. The man stood quite still by the carcass with uplifted axe, and presently the dasyure came back to the carcass and started feeding as if nothing unusual had happened!

The spotted-tailed tiger-cat brings forth from four to six young about May. As is the case with all members of this family, the males retire when the young are born, and take to the more open country, leaving the mothers to rear their young in a secure retreat in a secluded valley. They have a keen sense of smell, and will follow a man's trail. How often has an ornithologist found a bird's nest and left it for further observation, only to find on a subsequent visit that it has been torn down and the contents rifled! Observation on the back trail will generally show the footprints of a tiger-cat. A smaller form exactly like the larger type, and known as the slender spotted-tailed tiger-cat, is found in North Queensland. This was secured by the late Robert Grant on the Bellenden Ker Range and by the late C. M. Hoy on the Atherton Tableland. *D. maculatus* is found in the same regions.

The smaller dasyures, commonly called native cats, are found all over the continent and in Tasmania. They are more common in the coastal regions than farther inland, and are rare in the dry central districts. These animals are nocturnal, living during the day in hollow logs, among stones, in holes in the ground, etc., and coming out at night to feed on small animals, birds, and insects. They are very venturesome in search of food, and will enter houses, taking scraps of meat or fat, and at times do damage to poultry, though if other food is available they do not care to tackle such big game. The native cats are almost silent, uttering only a slight hiss.

The south-eastern form, *D. viverrinus*, is now very scarce in Australia. In common with many other marsupials, it was decimated by a disease in the years 1901–2–3, and has disappeared over the greater part of its range, being common now, apparently, only in the vicinity of Sydney. The animals there, being isolated, were not affected.

From four to seven young are born in May or June. A female caught in Taronga Park on May 10 had seven young about the size of peas attached to the teats. By July 30 they were the size of mice, their naked skins showing the spots through. On August 10 they were showing outside the pouch, but the eyes were not open. They were, however, open on the 25th of the same month, and it could be seen that the young varied in colour—there were two blacks and three greys, two having disappeared. These animals can be handled with impunity, provided no quick movements are made.

Key to Species of Dasyurus

A. Tail spotted. Australia only	
Head and body, 495–765 mm. . .	*D. maculatus*
Head and body, about 325 mm. . .	*D. gracilis*
B. Tail not spotted	
b. Tip of tail white	
Body fur soft, thick, fawn grey or black	*D. viverrinus*
*b*¹. Tip of tail black	
Body fur soft, thick, olive grey	
Head and body, 360–400 mm. .	*D. geoffroyi geoffroyi*
Head and body, about 650 mm. .	*D. g. fortis*
Body fur short, coarse, yellowish brown	*D. hallucatus hallucatus*
Body fur short, coarse, drab grey .	*D. h. exilis*
*b*². Tail all black or dark brown. New Guinea only	
Body fur grizzled rufous brown. North-west New Guinea .	*D. albopunctatus*
Body fur olivaceous tawny. Papua	*D. dæmonellus*

Large Spotted-tailed Tiger-cat

Dasyurus maculatus, Kerr. Eastern Australia, Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 263. (Sub-genus *Dasyurops*, Matschie. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 262.)

Fur thick, close; under fur abundant, dark smoky brown. General colour above yellowish brown to dark brown; many of longer hairs with sub-terminal band rufous or orange; numerous white spots, chiefly confined to forequarters, sides of body, and outer parts of limbs; under parts white or pale yellow; base of hair slate, except in certain scattered spots; tail brown or rufous brown, spotted like body. Mammæ, 6. Head and body, 398–765 mm.; tail, 395–565 mm.; hind-foot, 77–88 mm.; ear, 24–30 mm. (measured in the flesh). (See Fig. 86.)

SLENDER SPOTTED-TAILED TIGER-CAT

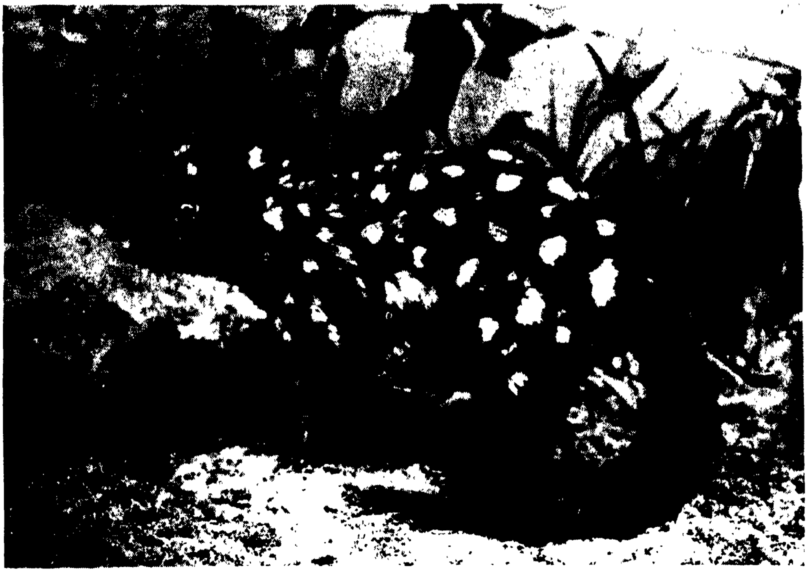
Dasyurus gracilis, Ramsay. North-east Queensland (Bellenden Ker Range). *Proc. Linn. Soc. New South Wales*, (2) iii, 1888, p. 1296.

Fur short, close, somewhat harsh to touch. General colour deep blackish brown, spotted white, spots more numerous on forequarters and sides, least on lower back; spots on sides and basal third of tail larger, sometimes confluent. Ears short, thinly haired externally at base, internally with tuft of long hairs at front edge. Hallux present. Claws long, powerful. Tail coloured and spotted like body, slender and tufted at extreme tip. Head and body, 325 mm.; tail, 240 mm.; hind-foot, 38 mm.; ear, 18 mm.

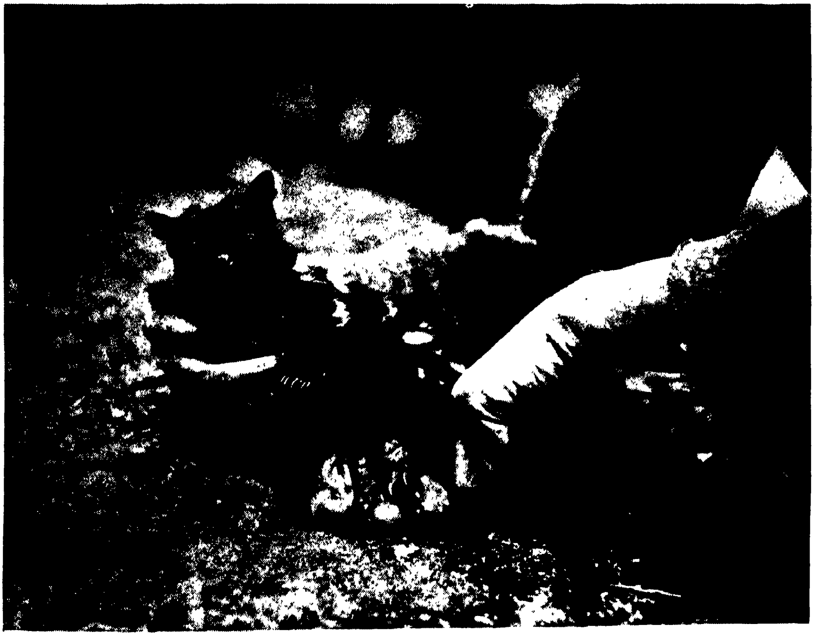
VIVERRINE NATIVE CAT

Dasyurus viverrinus, Shaw. New South Wales, Victoria, South Australia, and Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 265.

Fur thick, soft; under fur long, abundant, dark slaty grey, nearly black in parts. General colour above pale olive grey, profusely spotted white; under parts lighter; longer hairs everywhere, with yellow sub-terminal band, or jet black all over, with exception of white spots. No hallux. Tail bushy, proximal three-fourths coloured like back, but without spots, tip white. Head and body, 400–440 mm.; tail, 210–290 mm.; hind-foot, 60–65 mm.; ear, 27–28 mm. (See Figs. 87 and 88.)



87. Viverrine Native Cat (*Dasyurus viverrinus*), Black and White Type. Female



88. Native Cat with Young in Pouch
Showing one grey and two black young ones

89. Crested-tailed Phascogale (*Dasycercus cristicauda*)
See pp. 338–339.

90. Swainson's Phascogale (*Phascogale swainsoni*)
See p. 342.

GEOFFROY'S NATIVE CAT

Dasyurus geoffroyi geoffroyi, Gould. All Australia, except coastal belt of south-east, south-west, and extreme north. *Cat. Mars and Monot. Brit. Mus.*, p. 268. (Sub-genus *Dasyurinus*, Matschie. *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 262.)

Fur thick, soft; under fur long. General colour above olive grey, tinged rufous, profusely spotted white. Ears large, with prominent metatragus; backs brown, edges both internally and externally white; under parts white, bases of hairs slate. Hallux present. Tail well haired, basal half above and fourth below coloured like back, greater part of under part and end black. Head and body, 360–400 mm.; tail, 270–310 mm.; hind-foot, 60–63 mm.; ear, 31 mm.

Dasyurus geoffroyi fortis, Thomas. Coastal South-western Australia. *Proc. Zool. Soc.*, ii, 1906, pp. 476, 771.

Similar in all essential characters to *D. g. geoffroyi*, but larger, this difference being specially marked in the skull of the male. Externally *D. g. fortis* has the belly hairs whiter terminally, while in the true *D. geoffroyi* they are more or less tinged with creamy yellow; the under side of the tail is darker for a rather greater extent; skin of palms, sides, and under sides of the digits wholly blackish; in *D. g. geoffroyi* there is generally a whitish tinge in these parts. Head and body, 650 mm.; tail, 350 mm.; hind-foot, 63 mm.; ear, 50 mm.

NORTH AUSTRALIAN NATIVE CAT

Dasyurus hallucatus hallucatus, Gould. North Australia (Northern Territory and Queensland). *Cat. Mars. and Monot. Brit. Mus.*, p. 269.

Fur short, coarse; under fur thin, pale slaty brown. General colour above yellowish brown, white-spotted; longer hairs of back with sub-terminal band of dull yellow and long rufous-brown tip; sides of neck and body paler; under parts pale grey or yellow; face grizzled yellowish grey. Ears large, leafy, very thinly covered with fine yellow hairs; metatragus large. Feet thickly covered with short, coarse yellow hairs. Hallux present. Soles smooth, naked, with three anterior, one long postero-external, and two postero-internal pads, all distinctly striated. Tail short-haired, grizzled drab or buff above and on sides for about half its length, the under surface (except the extreme base) and end being black or blackish. Head and body, 270–300 mm.; tail, 210–215 mm.; hind-foot, 42–44 mm.; ear, 20–21 mm.

NORTH-WESTERN NATIVE CAT

Dasyurus hallucatus exilis, Thomas. Parry's Creek, North-west Australia. *Ann. Mag. Nat. Hist.*, (8) iii, 1909, *p. 152.*

Small pale form of *D. h. hallucatus*; colour drab grey; white spots very numerous, less sharply defined; ears, sides of neck, upper sides of hands and feet whitish. Tail with upper side lightly grizzled drab for three-quarters of its length, the under side and tip dark brown. Head and body, 266 mm.; tail, 219 mm.; hind-foot, 43 mm.; ear, 35 mm.

NORTHERN NEW GUINEA NATIVE CAT

Dasyurus albopunctatus, Schlegel. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 271.

Fur short, close, soft; under fur very thin, dark brown. General colour above dark grizzled rufous brown, white-spotted; neck, anterior back, sides, outer sides of limbs dark grizzled fulvous or rufous; hind-back darker, nearly black; body spots very small, larger ones from 5 to 7 mm. in diameter; under parts pale yellow or rufous. Head short, broad, dark fulvous. Ears short, rounded, nearly naked. Feet dark brown. Hallux present. Soles naked. Pads indistinct. Tail black or dark brown. Head and body, 270 mm.; tail, 230 mm.; hind-foot, 42 mm.; ear, 16 mm.

PAPUAN NATIVE CAT

Dasyurus dæmonellus, Thomas. South coast of Papua. *Ann. Mag. Nat. Hist.*, (7) xiv, 1904, p. 402.

General colour above dark olivaceous tawny; hind-back nearly black; white spots small, about 5 mm. in diameter, not present in front of eyes or on outside of limbs, rump, or tail; under parts dull whitish; throat more yellow; scrotum brown. Ears rounded, hairy, dark brown. Hands and feet dark brown. Hallux present. Head and body, 350 mm.; tail, 285 mm.; hind-foot, 53 mm.; ear, 30 mm.

STRIPED MARSUPIAL CAT

As pointed out in the introduction to this book, many of the marsupials resemble very closely in their external appearance well-known animals in other parts of the world. So far we have not described anything really resembling a cat, or any of the numerous species of the family Felidæ.

There exists in North Australia, however, a large striped animal which has been aptly described as "a cat just growing into a tiger." Though seen on several occasions, we have not yet had a specimen in any of our museums.

This animal is rare, or, to be more correct, it lives in country that man seldom penetrates, and when he does do so he creates such a noise in getting through the tangled undergrowth that any wary animal makes off. Its stronghold appears to be the rough, rocky country on top of the ranges, country usually covered with heavy forest, and inhabited chiefly by tree-kangaroos and rock-wallabies.

The cat-like animal is well known to the aborigines, and has been met with several times by white men. The first authentic account of it is given by Mr B. G. Sheridan, police magistrate at Cardwell. He states (*Proc. Zool. Soc.*, 1871, p. 629): "One evening, while strolling along a path close to Rockingham Bay, a small terrier, my son's companion, took a scent from a piece of scrub near the beach, and followed, barking furiously, towards the coast range to the west. My boy followed, and found in the long grass about a mile from the spot where the scent was first taken up an animal described by himself as follows: 'It was lying in the long grass, and was as big as a native dog. Its face was round, like that of a cat. It had a long tail, and its body was striped from the ribs under the belly with yellow and black. My dog flew at it, but could not throw him. The animal ran up a leaning tree. It then got savage and ran down the tree at the dog and at me. I got frightened and came home.' "

Mr George Sharp, a well-known and experienced naturalist and collector, noted this animal on one occasion when seeking the eggs of the golden bower-bird, at the head of the Tully River. He states that one evening, when about to retire (it was not dark), he heard a rustle in the scrub, and on looking round saw what he describes as a beast "larger and darker than the Tasmanian tiger, with the stripes showing very distinctly." It was gone before he could raise his gun.

Shortly afterward one came after the goats of a settler in the Atherton district, and was shot. Mr Sharp went to the place and saw the skin, which he described as being about five feet long from the nose to the tip of the tail. As there was no means of preserving the pelt, it went bad; the head and body had in the meantime been eaten by wild pigs.

One such animal was trapped by Mr Endres, of Mundubbera, Queensland. He describes it as being "about 18 inches high and as long as a large cat; very short head and neck; striped, but not right round; very savage when caught."

Mr J. L. Idriess, late of Coen, North Queensland, who has spent many years in the York Peninsula, has met with the animal on two occasions. He has given a very good account, from which we extract the following: "Up here in York Peninsula we have a tiger-cat that stands as high as a hefty, medium-sized dog. His body is lithe and sleek and beautifully striped in black and grey. His pads are armed with lance-like claws of great tearing strength. His ears are sharp and pricked, and his head is shaped like that of a tiger. My introduction to this beauty was one day when I heard a series of snarls from the long buffalo-grass skirting a swamp. On peering through the grass I saw a full-grown kangaroo, backed up against a tree, the flesh of one leg torn clean from the bone. A streak of black and grey shot towards the 'roo's' throat, then seemed to twist in the air, and the kangaroo slid to earth with the entrails literally torn out. In my surprise I incautiously rustled the grass, and the great cat ceased the warm feast that he had promptly started upon, stood perfectly still over his victim, and for ten seconds returned me gaze for gaze. Then the skin wrinkled back from the nostrils, white fangs gleamed, and a low growl issued from his throat. I went backwards and lost no time in getting out of the entangling grass. The next brute I saw was dead, and beside him was my much-prized staghound, also dead. This dog had been trained from puppyhood in tackling wild boars, and his strength and courage were known by all the prospectors over the country. The cat had come fossicking round my camp on the Alice River." Mr Idriess likens the markings to those on the ard-wolf.

Mr G. de Tournoeur, writing to the *Brisbane Courier*, tells of an experience he had some years ago in company with Mr P. B. Scougall. They were riding toward Tiaro township from Munna Creek, when their horses suddenly shied. "We dismounted and were startled to find the cause to be a large animal of the cat tribe, standing about twenty yards away, astride of a very dead calf, glaring defiance at us, and emitting what I can only describe as a growling whine. As far as the gathering darkness and torrential rain allowed us to judge he was nearly the size of a mastiff, of a dirty fawn colour, with a whitish belly, and broad blackish tiger stripes. The head was round, with rather prominent lynx-like ears, but unlike that feline there were a tail reaching to the ground and large pads. We threw a couple of stones at him, which only made him crouch low, with ears laid flat, and emit a raspy snarl, vividly reminiscent of the African leopard's nocturnal 'wood-sawing' cry. Beating an angry tattoo on the grass with his tail, he looked so ugly and ready for a spring that we felt a bit 'windy'; but on our making a rush and cracking our stockwhips he bounded away to the bend of the creek, where he turned back and growled at us."

We have had a striped carnivorous animal described from North-west Australia, and Lord Rothschild states, from native reports, that a similar animal exists also in New Guinea.

Although there is nothing to indicate directly to what order this animal belongs, we believe it to be a marsupial, from the fact that it apparently cannot live in competition with the dingo. It inhabits the only country that the wild dog cannot penetrate. For the sake of convenience we will refer to it as the ‘marsupial cat.’

STRIPED MARSUPIAL CAT

Ranges of Cape York Peninsula, North Queensland.

Description from field observations. Hair short, rather coarse. General colour fawn or grey, with broad black stripes on flanks, not meeting over back. Head like that of a cat; nose more produced. Ears sharp, pricked. Tail well haired, inclined to be tufted at end. Feet large; claws long, sharp. Total length about five feet; height at shoulder eighteen inches.

PHASCOGALES

Genus Dasycercus, Peters, and *Phascogale*, Temminck

Small rat-like carnivorous animals, having the nose naked, and deeply grooved where it passes into upper lip. Ears rounded, more convex below and less pointed than in the dasyures; metatragus of the ear large and thin, its terminal part scarcely showing any trace of the folding found in *Dasyurus*. Feet broad, short, with toes nearly equal, provided with strong claws. First toe clawless. Palms and soles naked, granulated, with transversely striated pads, but with postero-internal one often divided. Pouch represented by two folds of skin, really noticeable only when containing young. Mammæ variable in number, from 4 to 10.

The phascogales are small, lively animals, found living in holes in the ground, among rocks and caves, or more rarely in holes in trees. They are largely insectivorous, but when opportunity offers will take small animals, birds, lizards, etc. Some species are particularly the enemies of rats and mice, often following up plagues of the latter and helping to reduce their numbers. The brush-tailed phascogale has been blamed for entering hen-roosts and killing fowls.

Most species are very active, and move about with a characteristically quick, jerky action. They show strongly the peculiarity of the family in being practically fearless if they have food, and may even be taken by hand.

Some species, notably the brush-tailed and the lesser brush-tailed phascogales, are now rather scarce over the greater part of their range, having been greatly reduced by disease, which swept off large numbers of native animals in 1898–9–1900. Cats have also been very destructive. Others, notably the yellow-footed, the crested-tailed, and Swainson's phascogales, are numerous; the former literally swarms in favourable localities.

They live readily in captivity, feeding on meat, insects, etc. During the day they are quiet, but at night they are wonderfully active, darting about with great rapidity. They seldom utter any sound, and then only a low "Chit! Chit!"

The crested-tailed phascogale is an inhabitant of the sand-hills and the open salt-bush plains of Central and South-central Australia. Spencer found it at Alice Springs, and we have noted it at Ooldea and Fisher, on the Trans-Australian line. Here the species lived in a hole in the ground, which it had apparently excavated, though tracks were also noted outside an old rabbit burrow. No doubt it takes possession of any convenient hole that is available.

A few days after being captured two of these animals forced open the door of a trap, a feat requiring some strength and determination, and escaped into a lumber-room filled with boxes and stores. Upon a baited trap being placed on the floor one of the animals at once went in; and when a piece of meat was offered the other by hand, it took it and allowed itself to be picked up. This species was, according to the aborigines, responsible for many shallow scratchings in the soil, evidently made in searching for insects. The excavations were concave, about an inch deep, and not pointed at the bottom like those made by the bandicoots.

Blythe's phascogale is found in the spinifex country in mid-Western Australia. The fat-tailed phascogale has been obtained from Alice Springs, where it was living in holes among rocks and under stones, and from Ooldea, in South Australia, where a specimen was taken from a hole at the base of a bush. The small fat-tailed phascogale is apparently a dwarf form of this species; Ingram's phascogale is a paler type of the lesser phascogale.

Swainson's phascogale is a cold-country species, living in Tasmania and in the mountains of Victoria and Northern New South Wales. It dwells in the forests, both in the undergrowth near the banks of streams and on the hills. In the former location it has been caught in the runways used by the swamp-rat. As far as can be noted, it is terrestrial, living in some shelter on the ground. That it is carnivorous is indicated by the fact that several specimens, together with yellow-footed phascogales, were caught near the body of a scrub-turkey, upon which they were feeding. They also ate a rat (*U. cervinipes*) that was caught in the locality, but did not touch *R. rattus* or *R. assimilis*.

The yellow-footed phascogale is a very common species, found in heavy forest, in lightly timbered country, and on the open plains, from North Queensland to Victoria; and in a slightly different form (*Ph. f. leucogaster*) in Western Australia. In most parts of its range it is very numerous.

Its common habitat is in the cavity of a sandstone cave, a crevice of a rock, or in a hollow log. In the former location it will build a nest in the wind-worn cavities in the roof or sides. This nest is made of eucalyptus leaves, and is used for breeding purposes only. The leaves are neatly packed and interlaced, and the opening to the nest is at the back. At other times the animal lives under stones or in some shelter. Once when search was being made for this species its whereabouts was indicated by a number of small footprints impressed in the soft sand at the bottom of a fissured cave. Promptly a trap, baited with a white beetle-grub, was set near a likely-looking crevice. Hardly had we turned away when a sharp snap told that the bait had been taken; we found that a hardy specimen had been caught. It had not let go the bait, and even when removed from the trap it still retained its hold on the insect. Examination of the excreta showed only the remains of ants and small beetles.

As may be supposed, in a species covering such a large extent of territory the forms vary a good deal. In the Atherton district, North Queensland, it is large, grey in colour, with rather soft fur. In the forests of Eastern New South Wales it is very dark brown all over. West of the Dividing Range it is grey, suffused with rufous. One specialized type, which has been designated as Burrell's phascogale, while having the teeth the same as in the typical form, is more robust, with wholly non-adpressed fur. A specimen kept in captivity at Taronga Park grew a crest on the tail in winter, which tuft quite disappeared in summer. This form is arboreal. Two nests found at Ebor, New South Wales, were both placed in small hollows, about forty feet from the ground, in smooth dead trees. The ordinary dark type was found in the forests in the same locality. This form, watched in captivity for some time, did not grow a tail-crest.

The late C. M. Hoy, when collecting for the National Museum, Washington, at Ravenshoe, North Queensland, found a species, as yet undetermined, which was "mostly diurnal, very quiet; several caught by merely walking up and taking by hand; makes a kind of sneezing noise when alarmed. Will climb trees when pursued; insects only in the stomach." A smaller form, with the same teeth character as *Ph. flavipes*, was "mostly diurnal, climbing about the trees and vines with great agility, leaping from limb to limb; insects only in the stomach."

The lesser phascogale is, as far as we can ascertain, a forest form, confined to North Queensland.

The brush-tailed phascogale is widely spread over the continent, living in the forests of the more verdant country. It is arboreal, and extremely active among the trees. Indeed, it behaves at times very much as the American grey squirrel does—staying head downward, watching every movement of the observer, and if pursued quickly putting the tree-trunk between itself and the enemy. It nests in the trees, making a cosy home of leaves, but will take pieces of rag or paper from camps or houses. On one occasion two timber-cutters were camped together at Ebor, New South Wales, and one missed a pound note. This caused rather a strained feeling, until the lost note was found in the nest of one of these animals in a tree close by which was felled for timber!

This species is more carnivorous than most members of the family. Moreover, it is very useful, in that it seems especially to catch rats and mice. There are instances of it following up plagues of these rodents and doing a good deal toward thinning them out. In Western Australia Mr G. Shortridge noted it round Beverley and York, and stated that it occasionally came into the settlers' houses after mice. The native name in the district was *coming coming.* A sub-species has been reported as being numerous in Arnhem Land, where it was called *wombo* by the aborigines.

A collector from the Adelaide Museum disturbed one of these animals from a grass nest which was made on the ground, and is exhibited in that institution. It appears that if suitable hollows are not available the species will make a nest on the ground.

Key to Species of Dasycercus and Phascogale

A. Back not striped	
a. Tail crested terminally (not tufted all round). Body hair short, soft, fine	
Body colour and base of tail reddish or sandy brown	*Dasycercus cristicauda*
Body colour much paler, soft drab. Base of tail slightly reddish. .	*D. hillieri*
a^1. Tail not crested, incrassated	
Tail covered proximally above with short, stiff yellowish hairs, then with gradually lengthening black hairs; lower surface of tail black except at base	*Phascogale blythi*

Tail covered with fairly long stiff hairs, lighter colour than body. Chestnut patch behind ear. Head and body, 92–120 mm. . . . . . *Ph. macdonnellensis*

Smaller and darker; head and body, 76 mm. . . . . . . *Ph. mimulus*

a^2. Tail tapering or cylindrical, under 130 mm.

Tail tapering gradually; hairs on proximal half much longer than on terminal, as variegated on back . *Ph. apicalis*

Tail cylindrical, evenly short-haired from close to base; hairs unicoloured. Ears short. Body colour uniform dark grizzled umber brown . . *Ph. swainsoni*

Body more or less yellow on hips, rump, belly. Ears large . . *Ph. minima*

Body grey, suffused rufous or dark brown all over. Hair adpressed . *Ph. flavipes flavipes*

Similar, but body olive brown . . *Ph. f. adusta*

Similar, but under surface and feet pure white . . . . . . *Ph. f. leucogaster*

Body grey. Hair not adpressed . *Ph. f. burrelli*

Body dull grey washed with brown . *Ph. godmani*

Body pale pinkish fawn . . . *Ph. bella*

Body finely grizzled mouse grey . . *Ph. minutissima*

Body brownish slaty grey . . . *Ph. ingrami*

Body soft warm brown . . . *Ph. subtilissima*

a^3. Tail tapering or cylindrical, more than 130 mm. long

Hair very short, soft, adpressed. Tip of tail white. Ears, hands, feet black *Ph. nouhuysii*

Hair long, dense, not adpressed. Ears externally white. Terminal quarter tail white . . . . . . *Ph. lorentzi lorentzi*

White of ears extending on to side of neck . . . . *Ph. l. venusta*

Hair fine, silky. Under part of head black. Tail not white-tipped . *Ph. naso*

Hair close, short, velvety, grizzled grey brown. Tail short-haired, dark brown or black . . . . *Ph. longicaudata*

Tail with hairs 4 to 5 mm. in length, black terminally . . . *Ph. melanura melanura*
Similar. Patch behind ear faint . *Ph. m. modesta*
Hair short and crisp, colour above brown, darkening posteriorly to burnt umber. Tail short-haired . *Ph. murex murex*
Similar, but with shorter skull . *Ph. m. aspera*
a^4. Tail with end evenly tufted all round
Base of tail grey . . . . . *Ph. penicillata penicillata*
Base of tail brownish grey . . *Ph. p. pirata*
Base of tail red . . . . . *Ph. calura*
B. Back striped
b. Tail long-haired above and laterally except at tip; reddish or orange, not white-tipped. Back with three stripes
Back and sides of neck chestnut or maroon. Hallucal pad continuous. Mesial stripe distinct on head . *Ph. thorbeckiana*
Neck and tail bright rufous. Hallucal pad divided. Mesial stripe on head indistinct or absent . . . *Ph. wallacei*
b^1. Tail comparatively short-haired, black; tip generally white. Back with single stripe
Back hairs orange-tipped. Belly dull orange rufous . . . . . *Ph. doriæ*
Back hairs white-tipped. Belly rich chestnut . . . . . *Ph. dorsalis*

Crested-tailed Phascogale

Dasycercus cristicauda, Krefft. Drier portions of Central South Australia (from Nullarbor Plain to Alice Springs). *Cat. Mars. and Monot. Brit. Mus.*, p. 276; *Horn Exped. Zool.*, ii, 1896, p. 22.

Hair short, soft, fine. General colour above mouse grey, tinged rufous on back; under surface, inner and anterior faces of limbs, upper surfaces of hands and feet white or cream coloured ; under fur on back slate grey at base, rufous terminally ; on ventral surface cream white terminally. Tail thickly covered on proximal half on upper and lateral surfaces with coarse chestnut-coloured hairs ; on ventral aspect hairs dark brown in colour ; about middle of length it is covered with coarse black hairs, which increase in length distally on upper and under surface, until, especially on upper surface, they form distinct black crest ; smaller crest present on under surface ; tail considerably swollen proximally, somewhat incrassated, though incrassation is hidden by body hairs, which pass on to root of tail. Ears laid forward reach posterior border of eye, covered on both surfaces with short stiff hairs. Eye surrounded by ring of light hairs. Small tuft of whisker-like hairs on forearm just above wrist. Palms with six granulated elevations, each with small unstriated pad. Soles of feet with three granulated elevations at base of toes, each with small unstriated pad ; soles hairy in heel region, with series of thickset strong hairs running along outer and inner margins, and bending over under surface, only the median part, as far back as heel, really naked ; median part strongly granulated. Mammæ, 4, 6, or 8. Head and body, 130–148 mm. ; tail, 85–89 mm. ; hind-foot, 26–28 mm. ; ear, 15·5 mm. (See Fig. 89.)

PALE CRESTED-TAILED PHASCOGALE

Dasycercus hillieri, Thomas. Lake Eyre, South Australia. *Ann. Mag. Nat. Hist.*, (7) xvi, 1905, p. 427.

Fur soft, fine ; hairs of back about 9 mm. in length. General colour above surface soft drab colour, with few longer hairs black ; sides lighter ; under surface pure white ; top of head like back, but rather more fawn ; cheeks and lips white ; ears thinly clothed with whitish hairs, inconspicuous whitish patch behind posterior bases ; upper surface of hands and feet pure white. Structure as in *D. cristicauda*. Tail slightly incrassated at base, crested above for terminal 2 inches with hairs 16 mm. in length ; colour of tail rather more rufous than body ; under surface darker, crest glossy black. Head and body, 150 mm. ; tail, 100 mm. ; hind-foot, 30 mm. ; ear, 17 mm.

BLYTH'S PHASCOGALE

Phascogale blythi, Waite. Mid-Western Australia (Pilbarra district). *Rec. Aust. Mus.*, v, 2, 1904, p. 122.

General colour above sandy, speckled with brown; base of fur dark grey; under sides pure white, hair white to base; top of nose pale yellow; eyes surrounded by ring of light hairs; upper whiskers black, lower ones white; fore-limbs pale yellow externally; hands thinly clothed with white hairs. Palms with granulated pads, each with striated area. Under surface of feet, with exception of heel, naked, but partly concealed by hairs on sides, which are bent underneath; three striated pads and small clawless hallux. Tail incrassated for proximal two-fifths, covered with short, stiff, yellowish hairs, remainder with gradually lengthening black hairs which do not form crest; lower surface black, with exception of small proximal portion, which is yellowish. Head and body, 132–150 mm.; tail, 95–102 mm.; hind-foot, 26·5–27·8 mm.

FAT-TAILED PHASCOGALE

Phascogale macdonnellensis, Spencer. Central and South-central Australia. *Horn Exped. Zool.*, ii, 1896, p. 27.

Fur moderately coarse. General colour above dull greyish brown, larger hairs being slate brown below and dark brown above; under fur slate grey, merging into light grey and brown at tip; ventral surface light grey; well-marked chestnut patch behind ear; light line above and below eye; light line runs along upper jaw, and is continuous at angle with white ventral surface of head and lower jaw. Ears rounded, clothed inside and out with short, light-coloured hairs; laid forward they reach to middle or to anterior canthus of eye. Hands and feet grey above. Palms and soles with six striated pads, proximal half pollical pad being curved, with concavity facing inward; proximal outer pad V-shaped, with apex pointing toward fingers. Small tuft of whisker-like hairs on posterior side of wrist. Hallucal pad divided into two. Tail notably stout on proximal half, tapering rapidly at about middle of length to end, and being covered with fairly long stiff hairs, lighter colour than body, lighter below. Mammæ, 6. Head and body, 92–120 mm.; tail, 170–177 mm.; hind-foot, 14–15 mm.; ear, 11·2–13 mm.

SMALL FAT-TAILED PHASCOGALE

Phascogale mimulus, Thomas. Alexandria, Northern Australia. *Proc. Zool. Soc.*, ii, 1906, p. 540.

Small species, with red patch behind each ear. Fur short and fine, about 5 mm. on back. General colour above browner than smoke grey; under surface dull creamy buff; head clearer grey than back; light line edging eyes above and below; ears clothed with fine rufous-brown hairs, behind each large and prominent patch of rufous. Soles with main pads arranged as in *Ph. macdonnellensis*, but surface less granulated and foot itself narrower, measuring only 3·4 mm. in breadth as against 5·2 mm. Tail slightly incrassated at base; thinly haired, dull rufous above, paler below. Head and body, 76 mm.; tail, 74 mm.; hind-foot, 13·5 mm.; ear, 16 mm. This species is closely allied to *Ph. macdonnellensis*.

FRECKLED PHASCOGALE

Phascogale apicalis, Gray. Queensland and Western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 277.

Fur coarse; under fur long, soft, close, base slate, terminal fourth rufous. General colour freckled reddish grey; longer hairs black, with white sub-terminal band, below which rufous tips of under fur show through; eyes surrounded by more or less distinct ring; under parts dull white or yellowish; hairs within pouch dark rufous; front and outside of forearm rufous; rest of outside of limbs dull grey; hands and feet grey. Ears short, not reaching, if laid forward, more than half distance toward eye, rounded over both surfaces with short grey hairs. Hands with six striated pads, pollical one being distinctly divided into two. Soles hairy just below heel, rest naked and granulated. Hallucal pad long, rarely subdivided; hallux barely reaching to proximal end of anterior pads. Tail evenly tapering, covered with hairs like those of back, except at extreme end, where they are black; under side uniform grey or yellowish grey. Head and body, 111–120 mm.; tail, 85–89 mm.; hind-foot, 21–23·5 mm.; ear, 8–8·8 mm.

SWAINSON'S PHASCOGALE

Phascogale swainsoni, Waterhouse. Highlands of New South Wales, Victoria, and Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 285.

Fur very long, soft, thick; under fur abundant, slaty blue, tips brown or yellowish. General colour deep rufous or umber brown; under parts dull brownish grey; base of hairs slate, tips white or pale grey; hairs of pouch dark red; limbs to wrists and ankles like back; hands and feet uniform dark brown. Ears short, broad, scarcely projecting beyond fur; laid forward they reach to about centre of eye; closely covered with short dark brown hairs. Palms and soles each with five pads, hallucal not or only indistinctly subdivided. Fore-claws very long and strong, extending from 3 to 4 mm. beyond tips of fingers. Tail with hairs short throughout, uniform dark brown. Head and body, 124–130 mm.; tail, 92–102 mm.; hind-foot, 19·5–21 mm.; ear, 9·5–11·5 mm. (See Fig. 90.)

LITTLE PHASCOGALE

Phascogale minima, Geoffroy. Tasmania and Three Hummock Island, Bass Strait. *Cat. Mars. and Monot. Brit. Mus.*, p. 287.

Fur thick, close, rather harsh, especially anteriorly; under fur abundant, soft, fine slaty grey, yellowish tips. General colour grey, strongly suffused yellow or rufous, paler on head and forequarters, darker and more orange on rump and hips; long hairs all black; chin white; chest and belly dirty grey, more or less suffused yellow. limbs like back, but greyer, except that there is generally well-marked patch of yellow on front of hips; hands and feet grey, yellowish, or brown. Ears short, rounded, nearly naked, bases generally with tufts of yellowish fur. Palms and soles smooth, naked, each generally with only five pads, pollical and hallucal usually continuous, but latter one sometimes subdivided, making total of six pads. Claws, especially anterior, very long, strong, extending beyond tips of fingers by 3 to 4 mm., horn-coloured. Tail uniformly closely haired, hairs just long enough to hide scales, brown above, rather paler beneath. Head and body, 135 mm.; tail, 85 mm.; hind-foot, 19 mm.; ear, 10 mm.

YELLOW-FOOTED PHASCOGALE

Phascogale flavipes flavipes, Waterhouse. Eastern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 289.

Colour very variable; fur close, rather crisp in texture; under fur abundant, soft, and silky, slaty blue with yellow tips. General colour grey, suffused yellow or rufous; head and neck clear grey; sides of body, chin, chest, belly yellow, which sometimes deepens into deep rufous and spreads over whole body; bases of belly hairs always dark slaty grey; pouch hairs red, yellow, or white; limbs and feet more or less like belly. Palms and soles naked, each with six pads, pollical and hallucal both as a rule divided. Claws small, delicate, usually surpassing tips of toes only by 1·5 to 2 mm. Tail uniformly short-haired throughout, hairs just hiding scales, brown or yellow above, lighter below, terminal inch sometimes black. Mammæ, 8. Ears large, projecting beyond fur, laid forward reaching anterior canthus of eye; naked above, but bases tufted yellow or grey. Head and body, 108–130 mm.; tail, 84–90 mm.; hind-foot, 17–19 mm.; ear, 10–10·5 mm. Female smaller than male. (See Fig. 91.)

Phascogale flavipes adusta, Thomas. Ravenshoe, North Queensland. *Ann. Mag. Nat. Hist.*, (9) xi, 1923, p. 175.

Fur close and fine, hairs of the back about 6 mm. in length. General colour above olive brown, slightly warmer posteriorly; head concolorous with the fore-back, without rufous patches or blackish median line; hands and feet pale brown; tail brown above, lighter below, hairs of the terminal part slightly lengthened, so as to form an inconspicuous blackish pencil, longer below than above. Head and body, 107 mm.; tail, 94 mm.; hind-foot, 21 mm.; ear, 18 mm.

WESTERN YELLOW-FOOTED PHASCOGALE

Phascogale flavipes leucogaster, Gray. Western and Northern Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 291.

Similar to typical variety, except that under surface is white; bases of hairs slate grey.

BURRELL'S PHASCOGALE

Phascogale flavipes burrelli, Le Souef, *sub-sp. nov.* Highlands of Northern New South Wales. Type numbered M. 2593 in the Australian Museum, Sydney.

Fur long, soft, woolly, not adpressed. Colour above grey; under parts whitish; feet white. Tail hairy, in winter with slight crest superiorly and inferiorly (this character apparently disappears in summer). Hands and feet proportionately larger than in *Ph. f. flavipes*, but pads similar. Teeth same as in *Ph. f. flavipes.* Head and body, 90 mm.; tail, 80 mm. (See Fig. 92.)

GODMAN'S PHASCOGALE

Phascogale godmani, Thomas. Ravenshoe, North Queensland. *Ann. Mag. Nat. Hist.*, (9) xi, 1923, p. 174.

Essential characters as in *Ph. flavipes*, but with smaller proportion of head and body to tail, which is short-haired and untufted; fur close, thick; hairs of back 8 mm. in length. General colour above dull greyish; hair brown anteriorly, dull coppery or cinnamon brown on rump and base of tail; under surface washed with cinnamon, hairs slate for greater part of length; muzzle and sides of face tending to cinnamon; inconspicuous dark median line on

91. Yellow-footed Phascogale (*Phascogale flavipes flavipes*), Brown Type

92. Burrell's Phascogale (*Phascogale flavipes burrelli*)

93. BRUSH-TAILED PHASCOGALE (*Phascogale penicillata penicillata*)
See pp. 349–350.
Photo F. E. George

top of nose; hands and feet pale brown above. Tail short-haired throughout, fine hairs at tip slightly longer above; brown above, little lighter below. Head and body, 143 mm.; tail, 122 mm.; hind-foot, 23 mm.; ear, 19 mm.

FAWN-COLOURED PHASCOGALE

Phascogale bella, Thomas. South Alligator River, Arnhem Land, Northern Territory. *Nov. Zool.*, xi, 1904, p. 229.

Allied to *Ph. flavipes*, larger. Fur close, fine, less woolly than in allied species. General colour above, including head, back, sides, pale pinkish fawn; under surface white, tinged drab, slaty bases to hairs showing through; eyes with lighter marks above and below; upper surface of hands and feet white. Tail proportionately longer than in *Ph. flavipes*, well haired, cylindrical, base hairy, coloured like back; middle line of upper surface pale brownish, sides and under surface white. Head and body, 114 mm.; tail, 108 mm.; hind-foot, 22 mm.; ear, 17 mm.

LESSER PHASCOGALE

Phascogale minutissima, Gould. Central and Southern Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 292.

General appearance very mouse-like. Fur soft, short, fine, mainly composed of under fur. General colour finely grizzled mouse grey; lips and chin white; under sides and inner sides of limbs like back, but paler, hairs slate grey at base and pale grey at tips; hairs of pouch shining grey; hands and feet pale brown. Palms and soles quite naked, former with six pads and latter with seven, owing to development of minute supplementary pad on outer side of foot, half-way between pad of fifth toe and postero-external pad. Ears laid forward reaching centre of eye, thinly clothed with pale brown hair. Tail uniformly short-haired throughout; scales very small, averaging about 25 to the cm. Head and body, 67–72 mm.; tail, 59–65 mm.; hind-foot, 10·4–11·2 mm.; ear, 6·8–7·7 mm.

INGRAM'S PHASCOGALE

Phascogale ingrami, Thomas. Alexandria, Northern Territory. *Proc. Zool. Soc.*, ii, 1906, p. 541.

Fur soft, close, fine ; hairs of back about 4 mm. in length, brownish slaty grey, with paler tips ; under surface paler, with yellowish tinge, hairs slaty at base, except at chin ; cheeks and chin whitish ; whitish-buffy line just over each eye ; ears clothed with fine buffy-whitish hairs ; upper surface of hands and feet whitish. Tail uniformly short-haired ; pale brownish white. Head and body, 80 mm. ; tail, 60 mm. ; hind-foot, 10 mm. ; ear, 9 mm. This species resembles pallid form of *Ph. minutissima.*

SMALL BROWN PHASCOGALE

Phascogale subtilissima, Lönnberg. Kimberley district, North-west Australia. *K. Svenska Vetak. Handl.*, 52, 1, 1913, p. 9.

Resembles *Ph. ingrami.* Fur soft, close, somewhat silky. General colour above soft and warm brown, produced by buff of outer parts of hairs being sprinkled with blackened tips ; on sides of head, above eyes, behind ears, and along flanks buff dominant, bases of hair slaty ; under surface dull white. Tail short-haired, scales not concealed, pale brownish grey. Feet brownish white. Head and body, 45 mm. ; tail, 51 mm. ; hind-foot, 8·5 mm. ; ear, 6 mm.

SOFT-HAIRED PHASCOGALE

Phascogale nouhuysii, Jentink. Mountains of Dutch New Guinea. *Notes Leyden Mus.*, xxxiii, 1911, p. 235.

Hair very soft, short, adpressed. Upper parts black, having sprinkling of hairs tinged reddish brown, this colour being predominant on sides and upper parts of head ; under parts golden red, hairs basally mouse-coloured ; ears, hands, and feet black ; tip of tail white for half-inch. Head and body, 195 mm. ; tail, 170 mm. ; hind-foot with claw, 33 mm.

LORENTZ'S PHASCOGALE

Phascogale lorentzi lorentzi, Jentink. Hellwig Mountains, Dutch New Guinea. *Notes Leyden Mus.*, xxxiii, 1911, p. 234.

Description of melanistic form, on which the original description was based. Fur very long, dense, not adpressed. Anterior part of back and head with thickset black hairs; in centre and posterior dorsal area hairs have whitish sub-terminal ring, giving those parts finely grizzled appearance, latter colour dominating also shoulders and haunches; under parts yellowish, suffused reddish brown; feet black; hands sooty; ears externally white-haired, inside white with black margin; distal part of tail for one-fourth of length white. Claw strong and large. Head and body, 229 mm.; tail 200 mm.; hind-foot with claw, 38 mm.

The non-melanotic form is deep rich rufous above, profusely speckled with whitish; under fur blackish at base, rich rufous terminally, longer hairs with white sub-terminal bands and black tips; sides more greyish, though still freckled; head rich rufous brown, not freckled; hands and feet brown; legs deep rusty.

WEYLAND MOUNTAINS PHASCOGALE

Phascogale lorentzi venusta, Thomas. Weyland Mountains, Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (9) viii, 1921, p. 358.

Under surface much less rufous, colour being dull pale cinnamon; lower outer part of forearms and legs dull grey brown; head mixed buffy and black; ears almost naked internally, metentote with few ochreous hairs, externally finely clothed with few whitish hairs, which extend on to sides of neck and form prominent whitish patch; digits dark brown.

SILKY-HAIRED PHASCOGALE

Phascogale naso, Jentink. Hellwig Mountains, Dutch New Guinea. *Notes Leyden Mus.*, xxxiii, 1911, p. 236.

Hair fine, silky; upper surface and flanks brownish, mouse-coloured at base, and intermixed with some whitish hairs;

hair of under parts with mouse-coloured bases and whitish tips; under parts of head sooty black; hairs generally shorter than in *Ph. lorentzi*, not adpressed like *Ph. nouhuysii*; tail with adpressed, rather short brownish hairs, basal parts covered with sharply defined ring of much longer hairs for about 10 mm.; hands and feet sooty-coloured, hair extending over small curved claws. Head and body, 145 mm.; tail, 145 mm.; hind-foot, 27 mm.; ear, 16 mm.

LONG-TAILED PHASCOGALE

Phascogale longicaudata, Schlegel. Aru Islands. *Cat. Mars. and Monot. Brit. Mus.*, p. 293.

Fur close, short, velvety; under fur very thin, slaty blue. General colour above finely grizzled grey brown; head, neck, fore-back, fore-limbs all of this colour; posterior, back, rump, hind-limbs suffused rufous, deepest at base of tail; under surface white, hairs grey at bases. Ears naked, small rufous mark just behind them. Hands and feet dark brown. Soles naked, with five pads, hallucal one being continuous. Tail with basal inch hairy like rump, then short-haired, rat-like, hairs very thin, dark brown or black. Head and body, 146 mm.; tail, 172 mm.; hind-foot, 24 mm.; ear, 9 mm.

VELVET-FURRED PHASCOGALE

Phascogale melanura melanura, Thomas. New Guinea. *Ann. Mus. Civ. Genova*, (2) xx, 1899, p. 191.

Related to *Ph. longicaudata*; smaller and with longer tail, which is well haired. Fur short, close, velvety. General colour above grizzled mouse brown; rather more rufous on rump; patch behind ears pale rufous; under parts washed with pale buff; hands and feet pale brown. Five sole-pads, hallucal pad undivided. Tail coloured like back for basal half-inch, remainder covered with hair, 4 to 5 mm. in length, hiding scales, brown proximally, darkening to black terminally. Head and body, 106 mm.; tail, 120–128 mm.; hind-foot, 20 mm.; ear, 16 mm.

PALE VELVET-FURRED PHASCOGALE

Phascogale melanura modesta, Thomas. Mount Goliath, South-west New Guinea. *Ann. Mag. Nat. Hist.*, (8) ix, 1912, p. 92.

Like typical form, except that the rufous patch behind the ear is faint. Head and body, 106 mm.; tail, 126 mm.; hind-foot, 20 mm.; ear, 13 mm.

SATTELBERG PHASCOGALE

Phascogale murex murex, Thomas. Sattelberg, New Guinea. *Ann. Mag. Nat. Hist.*, (8) xi, 1913, p. 80.

Allied to *Ph. longicaudata*. Fur short, crisp; hair of back 5 to 5·5 mm. in length. General colour above Prout's brown, darkening posteriorly to burnt umber; head and sides more grey; under surface whitish, bases of hairs brown; limbs dark mouse colour externally, dull whitish on inner sides; hands and feet pale brown. Tail with basal inch hairy and remainder short-haired, brown. Head and body, 197 mm.; tail, 167 mm.; hind-foot, 35 mm.

Phascogale murex aspera, Thomas. Utakwa River, South-west New Guinea. *Ann. Mag. Nat. Hist.*, (8) xiii, 1913, p. 211.

Nearly allied to *Ph. m. murex*, but with shorter skull and heavier teeth. The limbs are the same brown colour as the body instead of being a little greyer, and the light ends of the hairs of the under sides are more or less buffy instead of being white. Head and body, 169 mm.; tail, 180 mm.; hind-foot, 33 mm.; ear, 21 mm.

BRUSH-TAILED PHASCOGALE

Phascogale penicillata penicillata, Shaw. Australia generally, except extreme north; not in Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 294.

Fur short, coarse; under fur thick, close. General colour above uniform finely grizzled pale grey; under surface and inner sides of limbs pale grey or white ; face with indistinct darker stripe down muzzle ; chin white ; pouch hairs dull rufous with white tips. Ears laid forward entirely cover eye, thin, nearly naked, hairs of back black, with broad sub-terminal white band. Feet and hands pale grey, becoming paler on toes and fingers. Palms and soles quite naked, former with six and latter with five unusually long primary pads ; hallucal one undivided, but there is minute supplementary pad behind ordinary postero-external pad, making six in all. Tail long, thick, basal part below coloured and haired all round like back, then shorter-haired, paler above, brown below, and terminal half thickly clothed all round with long black hairs, forming prominent brush. Mammæ, 10. Head and body, 240 mm. ; tail, 225 mm. ; hind-foot, 41 mm. ; ear, 24 mm. (See Fig. 93.)

ALLIED BRUSH-TAILED PHASCOGALE

Phascogale penicillata pirata, Thomas. Arnhem Land, Northern Territory. *Nov. Zool.*, xi, 1904, p. 228.

General colour above smoky grey, much paler than in *Ph.p. penicillata* ; under surface dull whitish ; tail drab or brownish grey for about two inches from base, remainder broadly tufted with black. Head and body, 200 mm. ; tail, 180 mm. ; with hairs, 205 mm. ; hind-foot, 32 mm.

LESSER BRUSH-TAILED PHASCOGALE

Phascogale[1] *calura*, Gould. South, Central, and South-west Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 296.

Fur long, soft, fine, nearly woolly, composed of under fur. General colour grey, with tinge of rufous ; head finely grizzled grey, hairs with nearly white sub-terminal band ; chin, chest, inner sides of limbs, belly sharply defined white, greater part of hairs being white to roots ; hands and feet white. Ears very large, leafy, almost naked except at bases, where at origins of both inner and outer margins there are well-marked tufts of bright red hair. Palms with five or six pads, pollical doubtfully divided into two. Soles quite naked, with five pads, hallucal and postero-external very long, undivided. Tail long, with basal half above short-haired, rich rufous, below sharply defined brown; terminal half evenly but slightly bushy all way round, uniformly black. Head and body, 125 mm.; tail, 147 mm.; hind-foot, 24 mm.; ear, 20 mm.

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[1] Sub-genus *Phascoloictis*, Matschie, *M. Zool. Mus.*, Berlin,, viii, 2, 1916, p. 263.

CHESTNUT-NECKED PHASCOGALE

Phascogale thorbeckiana, Schlegel. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 278.

Fur coarse, harsh; under fur thin, sparse. General colour above richly variegated chestnut, black, and yellow, with a black stripe; head dark yellowish rufous, central black stripe commencing on muzzle and passing backward along neck and back to rump; back hairs black, with yellow or orange sub-terminal band, becoming more rufous on rump; on fore-back, commencing on shoulders, two more black lines, space between lateral and central lines anteriorly white or pale yellow, sometimes very prominent, or it may be indistinct; sides of body grizzled black and yellow, becoming gradually paler below; chin and chest pale rufous; belly dull brownish yellow; hairs in pouch dark brown; forearms rich rufous; hands brown. Ears laid forward reach centre of eye, thick and fleshy. Palms with six pads, pollical distinctly divided into two. Soles with five pads. Tail evenly tapering, long-haired above, short-haired below, deep maroon red, upper side of tip black, under side rufous. Mammæ, 6. Head and body, 190–215 mm.; tail, 173–201 mm.; hind-foot, 39–43 mm.; ear, 15–18 mm.

WALLACE'S PHASCOGALE

Phascogale wallacei, Gray. South New Guinea and Aru Islands. *Cat. Mars. and Monot. Brit. Mus.*, p. 280.

Fur coarse, harsh; under fur thin, soft. General colour above variegated rufous, black, and chestnut; black stripe along back; head rufous yellow, mesial dark stripe not or scarcely visible until occiput; back and sides of neck and anterior back bright grizzled orange, hairs dark, with subterminal yellow band; patch on each side behind ears rich rufous; back with three black stripes, lateral ones commencing just above shoulders; under sides rufous or yellowish; fore-limbs and hands rufous or yellow, fingers brown, palms with six pads; rump and hind-limbs outside rich grizzled chestnut rufous in mainland forms, dull grizzled yellow in Aru Islands specimens; hind-feet mixed with red and brown, soles naked, with six pads. Ears laid forward only just reach eye, thick and fleshy. Tail long and tapering, very long hairs above, 14 or 15 mm. in length, rich chestnut mixed black, under side covered with shorter adpressed hairs. Mammæ, 6. Head and body, 175–185 mm.; tail, 144–168 mm.; hind-foot, 34–39 mm.; ear, 12 mm.

ORANGE-BELLIED PHASCOGALE

Phascogale doriæ, Thomas. North-west New Guinea (Mount Arfak). *Cat. Mars. and Monot. Brit. Mus.*, p. 282.

Fur thick, close, soft; under fur abundant, dark slaty grey. Head long, slender. General colour above dark grizzled orange brown; face and crown uniform finely grizzled yellowish grey; tips of hairs dark yellow; behind ears, back, and sides of neck dull rufous; back with well-defined mesial black line, commencing on occiput and running to base of tail; hairs of back black, with shining orange subterminal band; under parts brighter, more rufous. Ears short, not reaching eye when laid forward, their substance thick and fleshy, black, uniformly but sparsely covered inside and out with very short shining rufous hairs. Hands and feet black; palms and soles each with six pads. Tail with basal inch furred, like body, rest comparatively short-haired, but hairs of proximal half on upper side rather longer than below; colour of tail uniformly black, except terminal half-inch, which is white. Head and body, 152 mm.; tail, 152 mm.; hind-foot, 32·5 mm.; ear, 10 mm.

CHESTNUT-BELLIED PHASCOGALE

Phascogale[1] *dorsalis*, Peters and Doria. North-west New Guinea (Mount Arfak). *Cat. Mars. and Monot. Brit. Mus.*, p. 283.

Fur rather short, somewhat coarse ; under fur thick, dark slate grey. General colour coarsely grizzled grey brown; head grizzled, tinged orange or rufous ; mesial streak of back commencing indistinctly on muzzle, well defined on back; cheeks, bases of ears, chin, chest, belly, inner sides of limbs rich chestnut-red ; bases of hairs slate, except those of pouch, which are rufous; fore- and hind-limbs dark red to wrists and ankles ; hands and feet brown. Ears laid forward just reach eye ; patch of dark rufous at bases behind. Palm and some pads as in *Ph. doriæ*. Tail short-haired, except at base, evenly haired ; rufous at base, then black, except tip, which is white. Head and body, 134–167 mm. ; tail, 147–149 mm. ; hind-foot, 26–27 mm. ; ear, 12–14 mm.

POUCHED RATS

Genus Dasyuroides, Spencer

Similar to *Phascogale*, but with proportionately narrower feet, and having no first toe. The interesting animal known as Byrne's pouched rat was one of the finds of the Horn Expedition to Central Australia, being procured for Professor Sir Baldwin Spencer by Mr P. H. Byrne, at Charlotte Waters. It was found living in burrows in sandy and stony tablelands. Probably it has the same habits as the larger phascogales, being carnivorous and insectivorous, and coming out only at night; doubtless it feeds on the small rodents which are abundant in the central districts.

BYRNE'S POUCHED RAT

Dasyuroides byrnei byrnei, Spencer. Central Australia (Charlotte Waters). *Horn Exped. Zool.*, ii, 1896, p. 36.

External appearance very similar to crested-tailed phascogale. Fur close, soft, mainly composed of under fur. General colour above grizzled grey, with faint tinge of rufous, especially on head and back; chin, ventral surface, inner sides of limbs, upper sides of hands and feet white; small tuft of long, bristle-like hairs on wrist, directed backward. Tail rufous on proximal half, distal half well covered with long black hairs, which form very well marked dorsal and ventral crest. Ears naked, laid forward nearly reaching to anterior canthus of eye. Palms with five well-marked and faintly striated pads placed on granular elevations. First toe absent. Soles comparatively narrow, with three well-marked pads placed on elevations on base of toes; median part of sole naked and granulated, each side having well-marked, closely set series of hairs bending over toward mid-line. Pouch slightly developed, with two low lateral folds. Mammæ, 6. Head and body, 166–182 mm.; tail, 131–140 mm.; hind-foot, 37–39 mm.; ear, 18–23 mm.

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[1] Sub-genus *Phascolosorex*, Matschie, *Mitt. Zool. Mus.*, Berlin, viii, 2, 1916, p. 263.

PALE POUCHED RAT

Dasyuroides byrnei pallidor, Thomas. Killalpanima, east of Lake Eyre. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 330.

Similar in all essential characters to the true *byrnei*, but slightly smaller, paler, and with smaller bullæ. Head and body, 146 mm.; tail, 132 mm.; hind-foot, 40 mm.; ear, 26 mm.

POUCHED MICE

Genus Sminthopsis, Thomas

Small, mouse-like animals. Ears large, broad, rounded. Tail sometimes incrassated. Feet slender, delicate. Tarsus and metatarsus very long in comparison with toes; first toe present, but short and clawless. Soles and palms naked or partially hairy, naked part uniformly granulated; hind-pads either wholly absent or at most four in number. Mammæ, 8 to 10.

The *Sminthopsis* are the smallest of the pouched mice, and may be distinguished by their small, slender feet. They are exclusively Australian, not being represented in New Guinea or Tasmania.

Terrestrial in habit, they live among holes in the rocks, in the ground, under logs, or in heaps of *débris*. In Western New South Wales the fat-tailed pouched mouse has been known to take up its abode in crumpled newspaper, and on the Trans-Australian line it has been found among railway sleepers beside the line. We have had several notes of both *S. crassicaudata* and *S. murina* being ploughed up from holes in the ground where they were resting in nests made of grass, but there is no evidence to say if they made these holes or usurped those of the field-mice.

In Central Australia the fat-tailed mouse is reported by Mr Byrne to prefer the softer ground near the creeks or among the sandhills. *S. larapinta* keeps more to the stony tablelands, and *S. psammophilus* lives on the sandhills, among tussocks of porcupine grass (*Troida*).

Though probably mainly insectivorous, the pouched mice are at times carnivorous. On one occasion two were sent together in a box, on unpacking which we found only the remains of one, while its cheerful partner appeared plump and happy. Mr A. C. V. Bligh, of Toowoomba, Queensland, reports *S. murina* as being numerous at the same time as the common mouse (*M. musculus*), and feeding upon the latter.

In good seasons the small *Sminthopsis* will have up to ten young ones, which is a very big responsibility for such a tiny animal. On leaving the pouch the babies cling to the mother's back. Mr Joliff, of Manilla, New South Wales, reports having on one occasion ploughed up a mother with ten young ones clinging to her. When he first noticed the mother she was slowly but surely making good her escape over the clods with the babies on her back. When the young ones were removed she refused to leave them entirely. With fine resolution the devoted creature stayed near, and when the little mites squeaked she answered the call, coming back, and threading her way among the cluster, until they were all attached; she then sought cover under some bark.

In captivity these animals are quiet, and do not show any special activity. They feed on cake, meat, and insects, the amount they can eat being rather astonishing. On one occasion a specimen of *S. murina*, which weighed exactly three-quarters of an ounce, ate, in one night, three small lizards and five earth-grubs, weighing in all just one ounce. Every scrap—bones, skin, and tail—was eaten.

The incrassated tail of *S. crassicaudata* is a variable feature. When the animal is caught the caudal appendage is sometimes quite thin, but with good feeding it will develop the radish-shaped appearance.

Key to Species of Sminthopsis

A. Tail thin, not incrassated except in *S. m. constricta*
a. Soles with striated pads
Face with three stripes
Tail evenly haired, length of head and body . . . . . . *S. virginiæ*
Face with one stripe . . . . *S. rufigenis*
Face unstriped
Tail evenly haired, little longer than head and body . . . . *S. leucopus*
*a*¹. Soles with granulated pads, unstriated
Face with side stripe
Tail evenly short-haired, twice as long as head and body . . . *S. longicaudatus*
Face unstriped
Tail evenly short-haired, little longer than head and body. Back of ears slaty flesh colour . . . . *S. murina murina*
Similar to *S. m. murina*. Tail more or less incrassated . . . . *S. m. constricta*
Tail with hairs increasing in length distally
Line of black hairs on under surface *S. psammophilus*
B. Tail generally incrassated. Palms and soles with granulated or hairy pads
b. Stripe from muzzle to forehead
Tail, 88–99 mm. . . . . *S. nitela*

Tail, 95–111 mm. . . . . . *S. larapinta*
Tail, 65–70 mm. . . . . . *S. stalkeri*
b^1. No stripe on forehead
Tail, 53 mm. Palms naked . . . *S. crassicaudata*
Tail, 81 mm. Palms hairy . . . *S. hirtipes*

Striped-faced Pouched Mouse

Sminthopsis virginiæ, De Tarragon. Central Queensland. *Cat. Mars. and Monot. Brit. Mus.*, p. 300.

Fur rather short, very soft, silky. General colour above grizzled grey; face sandy rufous, with three longitudinal black lines, central one running from top of muzzle and two less distinct running from nose to eyes; hairs of back slate colour for two-thirds of length, then black, with white subterminal band, extreme tip black; under surface white or pale yellow, base of hairs grey; outside of upper arms and thighs like back; rest of limbs white. Sole pads similar to *S. leucopus*. Tail with hairs above dark brown, below lighter. Head and body, 125 mm.; tail, 125 mm.; hind-foot, 22 mm.; ear, 13 mm.

Aru Islands Pouched Mouse

Sminthopsis rufigenis, Thomas. Aru Islands. *Nova Guinea*, xiii, 1922, p. 723.

General colour dark lined greyish brown; under surface grey; muzzle with dark median line, gradually disappearing on the crown; cheeks bright rufous. Soles hairy under calcaneum, remainder naked, slightly granulated, the four pads arranged as in *S. murina*, the distal ones very finely and indistinctly striated. Head and body, 91 mm.; tail, 102 mm.; hind-foot, 21·3 mm.

White-footed Pouched Mouse

Sminthopsis leucopus, Gray. Eastern Australia, from Cape York to Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 302.

Fur short, fine, straight, composed almost wholly of under fur. General colour above uniform dark greyish brown, backward from base of toes to hallux. Tail thin, covered with short stiff whitish hairs laterally and dorsally, with well-marked line of black hairs ventrally, hairs increasing slightly in length on upper and lower surface of tip, forming slight crest. Palms granulated, with six ill-defined elevations, but no striated pads. Soles hairy; three pads at base of toes placed on slight granulated elevations, not striated. Ears reaching half-way between eye and tip of nose. Head and body, 105 mm.; tail, 116 mm.; hind-foot, 25 mm.; ear, 24·5 mm.

FOREHEAD-STRIPED POUCHED MOUSE

Sminthopsis nitela,[1] Collett. Northern Territory (Daly River). *Proc. Zool. Soc.*, 1897, p. 335.

Allied to *S. leucopus*, but characterized by central stripe from muzzle to centre of forehead, incrassated tail, smooth pads. Fur close, dark greyish brown, whitish on lower surface; hands and feet greyish white; cheeks orange rufous; snout more greyish; black mesial stripe from nose to between ears; tail greyish white, slightly incrassated. Palms granulated, with six small pads, four anterior very small, narrower than breadth of claws, two posterior somewhat larger. Small callosity on wrist. Head and body, 70–89 mm.; tail, 88–99 mm.; heel to tip of claws, 18–22 mm.

CENTRAL POUCHED MOUSE

Sminthopsis larapinta, Spencer. Central Australia (stony tablelands) to Northern Territory (Alexandria). *Horn Exped. Zool.*, ii, 1896, p. 33.

Fur very soft, fine, composed mainly of under fur, with few longer and darker hairs intermixed. General colour above drab or mouse grey, suffused on dorsal surface with rufous; contrasted dark line running down muzzle; sides, under surface of body, head, upper surface of hands and feet white. Ears laid forward reach considerably beyond eye. Palms naked and granulated, posterior external pad V-shaped, with apex pointing forward and striated. Small tuft of whisker-like hairs just above wrist. Soles granulated anteriorly; on median part four pads present, small one at base of hallux, three larger ones at base of toes, latter faintly striated. Tail strongly incrassated, tapering to long thin point, strongly scaled, with, at proximal end, short hairs which do not hide scales; distally hairs more numerous, and somewhat longer toward tip. Head and body, 85–95 mm.; tail, 95–111 mm.; hind-foot, 17·5–18·2 mm.; ear, 14–16 mm.; width of hind-foot, 3·4–4 mm.

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[1] Thomas has stated (*Proc. Zool. Soc.*, ii, 1906, p. 543) that this species appears to be synonymous with *S. larapinta*, Spencer.

NORTHERN TERRITORY POUCHED MOUSE

Sminthopsis stalkeri, Thomas. Northern Territory. *Proc. Zool. Soc.*, ii, 1906, p. 543.

Small species coloured like *S. larapinta*, but with more hairy soles, shorter tail, more buffy tone. General colour above buffy grey; under surface creamy white; head like back, with rather indistinct darker line on forehead. Palms and soles intermediate between hairy-footed *S. hirtipes* and ordinary naked-footed species. Centre of foot finely haired to top of hallux, few hairs extending back to large compound pad. Tail incrassated at base, finely haired, greyish white. Head and body, 70 mm.; tail, 65 mm.; hind-foot, 15 mm.; ear, 17 mm.

FAT-TAILED POUCHED MOUSE

Sminthopsis crassicaudata, Gould. Australia generally. *Cat. Mars. and Monot. Brit. Mus.*, p. 306.

Fur very soft, fine, composed almost wholly of under fur, without any admixture of coarser hairs. General colour above clear ashy grey, more or less suffused fawn; face with yellowish tinge, especially between eyes and ears; hairs of back dark slate, tipped with fawn or yellowish; under surface greyish white. Ears narrowly rounded off, laid forward reaching considerably beyond eye, back brown anteriorly, then yellowish flesh colour, and posteriorly slate grey, anterior dark band contrasting markedly with rest; inside of ear with few short yellowish tufts of hair along edges.

Hands and feet white. Palms naked, coarsely granulated. Pads vague and rudimentary. Soles, except anterior fourth and narrow line extending backward along centre, thickly clothed with velvety hairs; naked parts coarsely granulated, large trefoil-like projections without distinct pads; tail generally incrassated, tapering, grey above, white beneath. Mammæ, 10. Head and body, 75–85 mm.; tail, 52–53 mm.; hind-foot, 14·5 mm.; ear, 12·5–14 mm. (See Fig. 95.)

HAIRY-FOOTED POUCHED MOUSE

Sminthopsis hirtipes, Thomas. Central Australia. *Nov. Zool.*, v, 1898, p. 3.

General colour above fawn; under surface lighter. Ears laid forward reach some way beyond anterior canthus of eye. Hands and feet different from those of any other species; hands with large trefoil elevation occupying whole palm, elevation being covered over with fine silvery hairs; no normal pads; under surface of digits naked, finely granulated; feet hairy below, except just along middle line of digits; long hairy elevation along terminal line of metatarsus, without any pads; hairs on under surface form distinct silvery fringe from ankle to tip of fifth toe. Tail slightly incrassated on basal half, dull whitish throughout. Head and body, 76 mm.; tail, 81 mm.; hind-foot, 19 mm.; ear, 22·5 mm.

JERBOA-LIKE POUCHED MICE

Genus Antechinomys, Krefft

Ears very large; metatragus large, thin, projecting backward distally. Tail very long, tufted. First toe absent. Palms and soles without distinct pads, latter hairy for greater part of length. Mammæ, 6 (Spencer) to 8 (Krefft).

This delicate little marsupial, which is very similar in appearance to the small jerboa-like rodents of the genus *Notomys*, can be distinguished at once by the absence of the four cutting incisor teeth of the typical rats, and by the absence of pads on its long hairy soles, also by the absence of a hallux, or great toe. Although a marsupial, its pouch is developed only in the breeding season.

The jerboa-like pouched mouse is confined to the central districts, and is rather scarce over its range. Like *Sminthopsis*, it probably does not make burrows of its own, but takes possession of any suitable shelter that it can find. We have had it reported from Western New South Wales as living under sheets of bark. Spencer found it in Central Australia living in association with, and in the same holes as, Mitchell's jumping mouse (*N. mitchelli*), which it very much resembles in external appearance. " It is somewhat curious to notice," says Spencer, " that two animals so differently organised as *Hapalotis* (*Notomys*) and *Antechinomys* have taken on the same habit and live side by side, one in large numbers and the other very scarce." We suggest that the reason is that *Antechinomys*, unable to make a home of its own, has sought shelter in the home of the *Notomys*. It is apparently confined to the sandy plains districts. Professor Sir Baldwin Spencer was fortunate enough to see what probably no naturalist had witnessed before—one of these rare little animals hopping about in its own environment. He writes as follows (*Across Australia*, p. 169) : " One bright moonlight night, when sitting quietly out in the stony plain near Charlotte Waters, some little distance from the camp, where all was perfectly quiet, our attention was drawn to a little animal that was darting about. Its movements were so rapid that until it came close to us we were unable to tell what it was ; but then we at once saw that it was an *Antechinomys*. The little creature was evidently curious, and as we remained perfectly still it jumped about, first on one side, then on the other, stopping every now and then to look at us. It stood on its hind-legs, with its body nearly erect, and its tail curved upwards, so that it did not actually touch the ground. In proportion to its size, the space of ground which it covered when jumping was remarkable. Its movements were so rapid that they were difficult to follow. It would perch itself on a stone, stand erect and look at us, and then, in a flash, it leaped away for at least six feet."

JERBOA-LIKE POUCHED MOUSE

Antechinomys laniger, Gould. South-western Queensland and Western New South Wales. *Cat. Mars. and Monot. Brit. Mus.*, p. 309.

Fur long, soft, fine, composed almost wholly of under fur. General colour above pale grizzled grey; head grey; colour lighter on cheeks, muzzle, above and behind eyes, and darker on crown, from which median patch passes backward along back of neck; large patch behind ear pale fawn; chin white; chest and belly grey at base of hairs, which have broad white tips; limbs from elbows and middle of tibia white. Ears large, ovoid, laid forward reaching half-way between muzzle and anterior canthus of eye, covered almost entirely with short, fine, fawn-coloured hair; fringe of white hairs, 5 mm. in length, along anterior edge. Palms naked, closely granulated all over, with trefoil-shaped anterior and smaller posterior prominence. Soles hairy all along elongated metatarsus, only naked part being trefoil-shaped prominence at base of toes. Tail thin, short-haired, fawn-coloured, prominent pencil of black hairs at terminal inch. Head and body, 84 mm.; tail, 121 mm.; hind-foot, 28 mm.; ear, 17·5 mm.

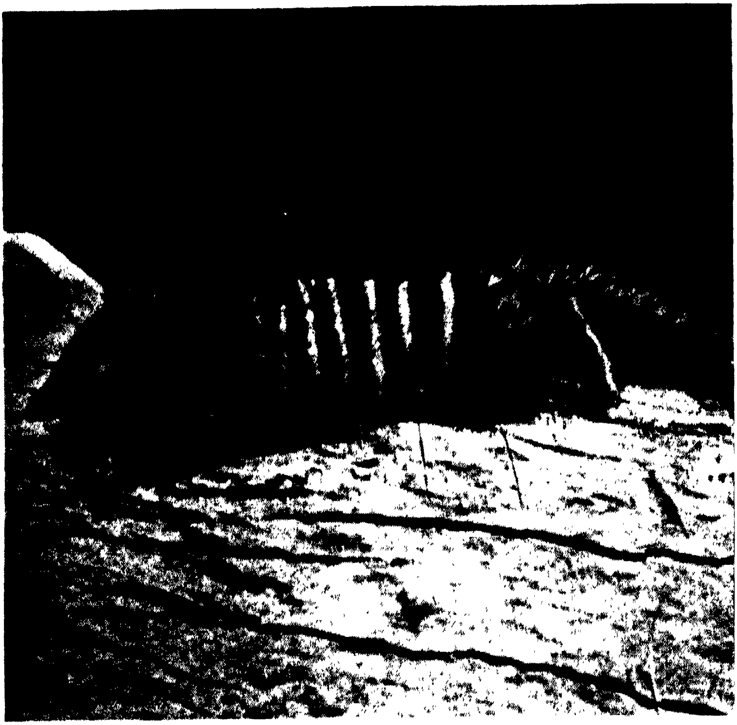
SPENCER'S JERBOA-LIKE POUCHED MOUSE

Antechinomys spenceri, Thomas. Central and Northern South Australia. *Ann. Mag. Nat. Hist.*, (7) xvii, 1906, p. 331.

Sandy-coloured species. Larger, with longer ears and much larger bullæ than *A. laniger*. Fur long, soft, fine, 9 to 10 mm. in length. General colour above dull sandy; hairs slaty-coloured at base, with dull sandy sub-terminal ring, and brown or blackish tip; under surface white, hairs slaty for basal third. Ears very large, fine short hairs pale buffy on proectote, whitish on metentote. Tail tufted, pale buffy on sides, mixed with brown on top and below, tuft dark seal-brown, 7–8 mm. in length. Head and body, 82–110 mm.; tail, 116–144 mm.; hind-foot, 29–33 mm.; ear, 19–23 mm.

94. GREY POUCHED MOUSE (*Sminthopsis murina murina*)
See pp. 358–359.

95. FAT-TAILED POUCHED MOUSE (*Sminthopsis crassicaudata*)
See p. 361.



96. Marsupial Banded Ant-eater (*Myrmecobius fasciatus*)

Photo E. Le G. Troughton

97. Marsupial Mole (*Notoryctes typhlops*)

See p. 369.

Photo Bolan

SUB-FAMILY MYRMECOBIINÆ

Marsupial Banded Ant-eater

Genus Myrmecobius, Waterhouse

Nose long; rhinarium naked, grooved below. Lower lip produced forward into long pointed projection, which fits into groove below rhinarium. Palate with about 14 transverse ridges. Tongue very long, extensile. Metatragus small, thick, triangular, rounded at tip, not folded distally. Chest with peculiar complex gland opening on surface by several distinct apertures. First toe wanting externally, although metatarsus is present in skeleton. Terrestrial. Insectivorous.

This little animal takes the place in our fauna of the ant-eaters found in South America. It is one of the most interesting of our mammals, for, like the lung-fish, platypus, and echidna, it is a peculiar form providing a link with the remote past. Mr Oldfield Thomas, in writing of this genus, states (*Cat. Mars. and Monot. Brit. Mus.*, p. 312): "This exceedingly remarkable genus differs from all the rest of the family to such a degree that it is very doubtful if a special family ought not to be made for it. Its chief interest lies in its close resemblance and, presumably, relationship to the Mesozoic Polyprotodont Marsupials of the English Jurassic beds, the resemblance being so close as to suggest that *Myrmecobius*, like *Ceratodus*, is actually an unmodified survivor from Mesozoic times."

Quiet, inoffensive, without means of defence or offence, it is remarkable that the marsupial ant-eater has survived through the ages. This could happen only in Australia, where it did not come into competition with the more advanced forms of life.

The marsupial ant-eater is found only in South and South-western Australia. Extending from Port Augusta to about the latitude of Perth, it inhabits the more or less timbered lands, where it can find its natural food-supply, the termite or white ant, and also get shelter among the roots of trees and in logs. It is abroad both by day and by night, and, being conspicuous and not at all speedy, it makes a fairly easy mark for predacious animals and birds, more especially the introduced cat and fox, to say nothing of the settlers' dogs. Consequently, it is one of the first animals to disappear before the inevitable opening up of the country, and it is now scarce over the greater part of its range, possibly being extinct in South Australia.

During the day it wanders about in search of termites, which it quickly gathers up with its long, extensile tongue. This, Sir George Grey said, can be protruded from the mouth for several inches, and moved about with great rapidity. When disturbed it at once makes for shelter, running, as Gilbert stated, on the ground with successive leaps, with the tail a little elevated, every now and again raising the body and resting on its hind-feet. Before entering the hollow it invariably sits up and looks round to ascertain the reality of approaching danger. In this kind of retreat it is easily captured, and when caught is so harmless and tame as to make scarcely any resistance. It never attempts to bite. When it has no chance of escape from its place of refuge it utters a sort of half-smothered grunt, apparently produced by a succession of hard breathings.

As the female has no pouch, the young are attached to the nipples, and carried about with the mother for some time. Gilbert has noted as many as seven. For the detailed statements of Sir George Grey and Gilbert, see Gould's *Mammals of Australia*.

MARSUPIAL BANDED ANT-EATER

Myrmecobius fasciatus, Waterhouse. South Australia, extending to South-western Australia. *Cat. Mars. and Monot. Brit. Mus.*, p. 312.

General colour above grey, more or less suffused rufous, darkening to blackish posteriorly, broadly banded white; chin almost hairless, flesh-colour; under surface clear pale yellow; dark central streak on throat of old males surrounding sternal gland; muzzle, forehead, crown grizzled rufous;

white stripe over each eye to base of ears; sometimes indistinct band running backward from angle of mouth. Palms naked, smooth; five small, rounded, finely granulated pads. Tail grizzled yellow and black above, rufous below. Mammæ probably variable in number, up to 8. Head and body, 220–240 mm.; tail, 160–175 mm.; hind-foot, 48–50 mm.; ear, 23–24 mm. (See Fig. 96.)

SUB-FAMILY NOTORYCTIDÆ

MARSUPIAL MOLES

Genus Notoryctes, Stirling

Body adapted for living underground. Snout covered with hard horny shield. No eyelids; eyes absent. Ears without conch. Four clawed fingers and toes, hallux and pollex with nail only, the former highly specialized for digging. Short, ringed, leathery tail. Teeth vary from 8 to 11 in each jaw.

The discovery of the marsupial mole in 1888 was a very interesting event. It added another and an unexpected type to the wonderfully diversified order of Marsupialia.

Unlike the true moles in other parts of the world, which like damp, 'earthwormy' country, the marsupial mole is found in the dry, hot regions of the interior, though it approaches the coast along the Australian Bight and in the North-west. It does not, as far as we know, live in burrows, but appears to work its way just under the surface of the sand, feeding on grubs as well as ants and their larvæ. During and after rainy weather it comes to the surface in the daytime, but probably more often at night; we have found the remains of two in castings from owls at Ooldea.

Mr Charles P. Conigrave, quoting Mr Coulthard (*Nat. Hist. Soc. West. Aust.*, No. 4, 1907, p. 21), states, in reference to a specimen procured for the West Australian Museum: "Mr Coulthard, attracted by the peculiar tracks, followed them, and found the animal lying under a tussock of spinifex. On emerging from the sand it travels at a slow pace, with a sinuous motion, the belly flattened against the ground, whilst it rests on the outside of its forefeet, which are thus doubled under it. It leaves behind a sinuous triple track, the outer impressions more or less interrupted, caused by the feet, and the central continuous line by the tail. In penetrating the soil, free use is made of the conical snout with its horny protecting shield, and the powerful scoop-like fore-claws are also brought into play. As it disappears from sight, the hind-limbs as well are used to throw up the sand as it goes, so that no permanent tunnel is left to mark its course."

That the mole has a voice is vouched for by Mr Byrne, who remarks in a letter to Professor Sir Baldwin Spencer regarding one he had in captivity: "Once or twice, when everything was quiet, he elevated his head and tail and made a slight, chirping sound, which he repeated two or three times, running forward a few steps between each cry."

For some time difficulty was experienced in keeping this species in captivity, but Mr A. G. Boland, of Ooldea, who had the opportunity of experimenting with them, writes: "I have proven definitely that they only come out after wet weather in sandy—or shall I say loose clear sandy?—country. They live on worms, insects, and beetles, and will drink milk. It is the cold that kills them in captivity."

Mr Boland was able to send one alive to Professor Wood Jones, of the Adelaide University. The latter writes: "I have very little to record of the habits of *Notoryctes*. Mine is intensely, feverishly active (very like the European mole). My specimen was munching earthworms five minutes after his box had been unpacked. He did not in any way resent being handled. He went round his box and regularly fell over at every corner, for he travelled with his nose down. He carried his little stump of a tail erect in the air, and, after a terrific tour round his box and feverish meal, next moment he would be fast asleep. He took milk from a spoon at breakfast and then worms, and but for his getting out and away into the cold I believe that he would be alive yet."

MARSUPIAL MOLE

Notoryctes typhlops, Stirling. Central and South Australia. *Tr. Roy. Soc. South. Aust.*, xi, 1888, p. 21, xiv, 1891, p. 154.

Form somewhat conical. Fur long, soft, silky, lustrous, consisting of fine under fur mixed with few coarser, flattened hairs; small, denser, somewhat darker patch just above sacral region. Colour varying from silvery appearance suffused with yellow to rich chestnut brown. Eyes absent; no eyelids. Ears without conch. Upper part of snout covered with hard horny shield. Tail tough, leathery, marked with rings, end blunt, knob-like. Four inner toes of both fore- and hind-feet clawed, fifth covered with short nail. Pouch opening backward. Mammæ, 2. Head and body, 148–180 mm.; tail, 21–26 mm. (See Fig. 97.)

NORTH-WESTERN MARSUPIAL MOLE

Notoryctes caurinus, Thomas. Type from Wollal, North-west Australia. *Ann. Mag. Nat. Hist.*, (9) vi, 1920, p. 111.

General colour pinkish cinnamon; slightly paler below; cheeks, chin, forearm more cinnamon buff. Head and body, 90 mm.; tail, 12 mm.; long anterior claw, 12·8 by 3·3 mm.; second claw, 12·2 by 6·7 mm.

EGG-LAYING MAMMALS, OR MONOTREMES

ORDER MONOTREMATA

THIS order contains two most interesting animals, the platypus and the echidna. These are the most primitive mammals known, forming as they do a connecting link between the mammals and the reptiles.

The two families, although widely different in habits and in appearance, have many important characters in common. The young are hatched from soft-shelled eggs, and nourished by milk exuded from lacteal glands. The uterus opens into a cloaca, which has a single external opening for the passage of fæcal matter and the eggs. Both monotremes have modified horny bills, and the males carry spurs on the hind-legs; the external ear does not possess any conch. Functional teeth are absent, though the young platypus has rudimentary teeth, the function of which is replaced in the adult by that of horny plates.

FAMILY ECHIDNIDÆ

ECHIDNAS, OR SPINY ANT-EATERS

Genus Tachyglossus, Illiger

Monotremes adapted for burrowing and an ant-eating life. Muzzle projected as cylindrical beak, modified to protect long, extensile tongue. Body covered with coarse hair and spines. Limbs short, strong, carrying wide, digging claws.

The echidna, or, as it is very commonly called, the spiny ant-eater or 'porcupine,' is widely spread over Tasmania, Australia, and New Guinea. It has five claws, while a closely allied form, *Zaglossus*, found in New Guinea, has three or five claws.

These animals inhabit the open forest or scrubby country, but are more at home in rough, rocky areas. Although often found about in the daytime, it is usually late afternoon before they will venture from their day retreat, a hole under a stone or in a hollow log, in search of food. If a person wants to see one in action he should find a place where freshly turned stones and excavated ants' nests denote a feeding-ground, and wait very quietly as the sun approaches the western horizon. Presently the noise of digging or the clicking of stones as they are moved will indicate the echidna's whereabouts, and the individual will be seen nosing about the flat stones under which ants and other things generally take refuge. It will tear away the stones, and quickly gather up the insects on its sticky tongue. It is specially fond of the large sugar-ant (*C. nigriceps*).

This lowly being has rather a keen sense of smell. We once noted one going on a straight journey, its body well up from the ground, walking on the edge of the turned-out claws, the quills, laid even and flat, being practically invisible among the hair. When passing to windward it stopped, waved its beak about as if testing the air, dropped to the crawling position, turned up its barrage of quills, slunk away to a log, and started to dig in.

Early in September the mother echidna lays an egg. This, we have reason to believe, is deposited directly from the cloaca into the pouch, for we have frequently noted that excreta are dropped, per medium of the protruding fundament, into the pouch if the animal is handled. From the egg is born a curious little naked baby, which is carried about by the parent for some weeks. When it has grown a protecting covering of hair it is deposited in some warm, dry nook, where it stays, in a lethargic state, prior to fending for itself. By this time its protecting quills will have come into being, providing the otherwise defenceless creature with some measure of protection.

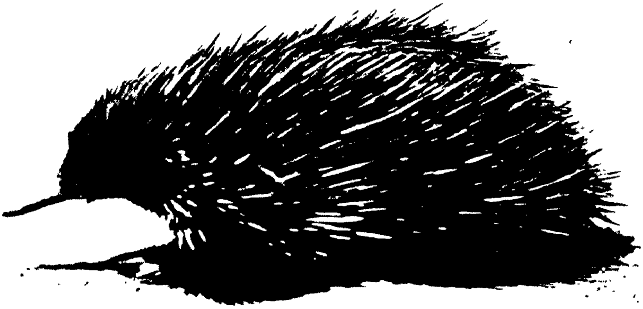
Echidnas will live well in captivity, provided they are kept in the shade. Sunlight with them, as with so many of our animals, is fatal. They may be fed with milk, raw egg, and finely minced meat. Young animals become quiet and tractable, and make nice pets, following their owner about like a puppy, and coming when called.

In the colder regions echidnas will hibernate in the winter. When in this state they show their reptilian character, as their temperature drops to within a few degrees of that of the outside air. A large male echidna will weigh about 9 pounds.

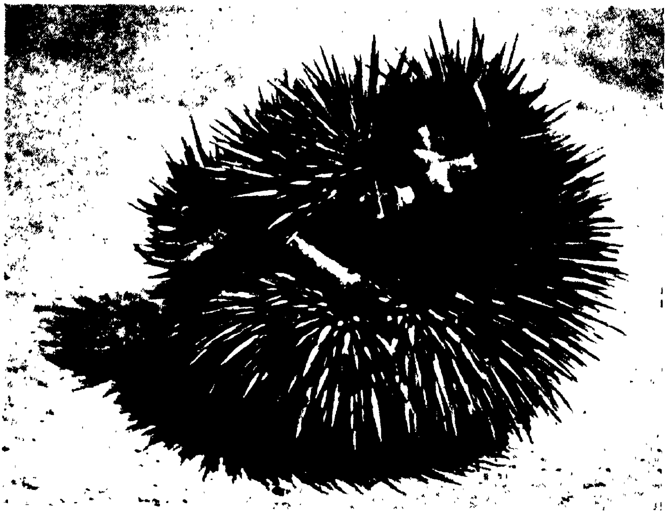
The function of the claw on the hind-foot of the male is probably connected with the sexual embrace, and may be used as a weapon against rivals.

Key to Species of Tachyglossus and Zaglossus

A. Beak short, cylindrical. Claws, 5	
Spines of back hiding hair. Third claw much shorter than second	*Tachyglossus aculeatus aculeatus*
Hairs partly showing through spines. New Guinea	*T. a. lawesi*
Hair nearly hiding spines. Third claw little shorter than second. Tasmania	*T. a. setosus*
B. Beak long, curving downward. Claws, 3–5	
b. Fur long, thick, entirely hiding spines on dorsal area. Claws, 5.	*Zaglossus bartoni bartoni*
Similar, but with more slender bill	*Z. b. clunius*
b^1. Fur of head, body, and limbs thick, coarse, and woolly; dark brown or black. Few white spines over body. Claws, 3–4	*Z. bruijnii bruijnii*
Similar, with spines more numerous, especially on under surface	*Z. b. goodfellowi*
Hair sparse; spines numerous, long, stout, and black	*Z. b. nigro-aculeatus*
Similar to *Z. b. goodfellowi*, but lacks all spines on under surface	*Z. b. gularis*

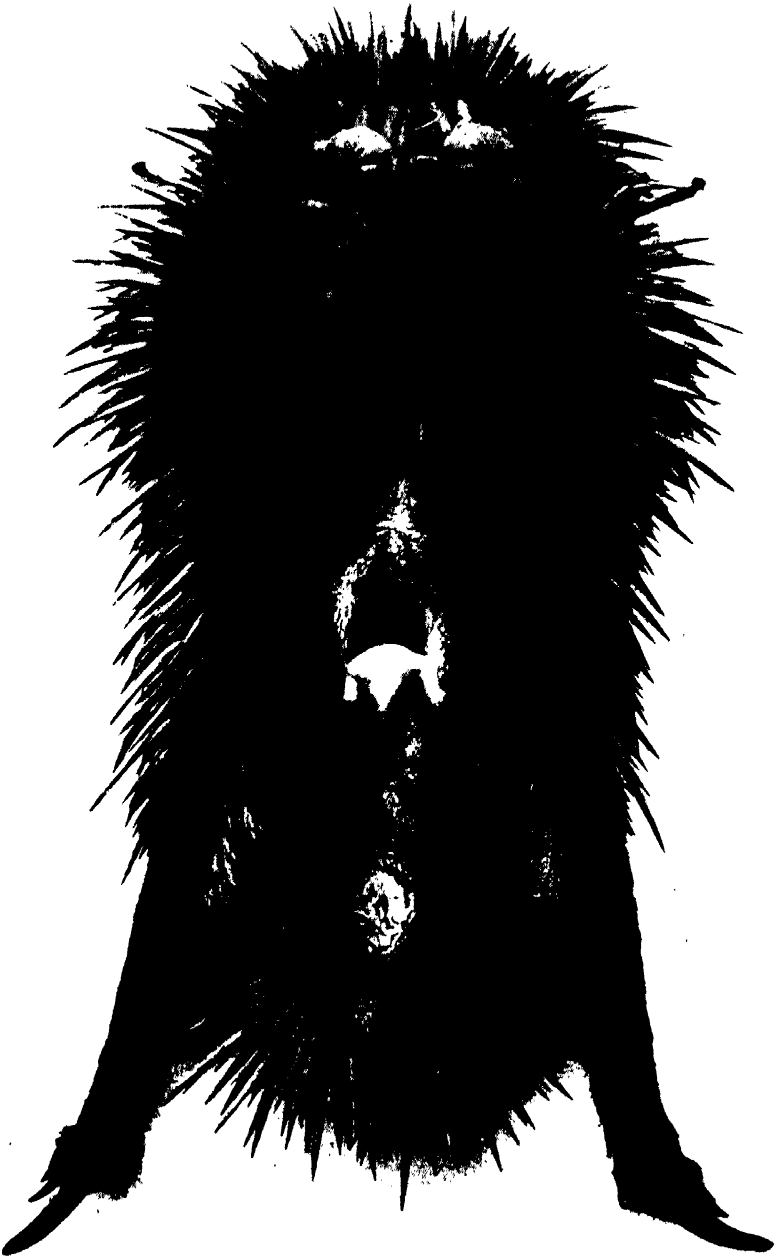


98. AUSTRALIAN ECHIDNA (*Tachyglossus aculeatus aculeatus*)



99. AUSTRALIAN ECHIDNA (*Tachyglossus aculeatus aculeatus*), ROLLED UP ON BACK

100. YOUNG ECHIDNA



101. Australian Echidna (*Tachyglossus aculeatus aculeatus*), Showing Young in Pouch

Similar to *Z. b. bruijnii*, but pale brown all over	*Z. b. villosissimus*
Similar to *Z. b. bruijnii*, but with whitish head and pale yellowish-brown pelage .	*Z. b. pallidus*

AUSTRALIAN ECHIDNA

Tachyglossus aculeatus aculeatus, Shaw. Australia generally. *Cat. Mars. and Monot. Brit. Mus.*, p. 379.

Body above covered with numerous spines, mixed with coarse black or brown hair; spines about two inches in length, yellowish-horn colour basally, black tips, few wholly yellow; limbs and whole of under sides clothed with dark brown hair, thickly mixed with flattened bristles, which entirely cover face and area round ears. Bristles on face extending forward on to beak in front of each eye, leaving naked backward projection in central line above. Anterior claws broad, short, straight, evenly increasing in length from sides to centre. Palms naked. On hind-feet hallux provided with short, blunt nail; second toe has long curved ' toilet ' claw twisted outward and backward; third, fourth, and fifth toes have small claws. Tail half-inch long, conical, smooth, naked terminally. Head and body, 425 mm. (See Figs. 98–101.)

NEW GUINEA SHORT-BEAKED ECHIDNA

Tachyglossus aculeatus lawesi, Ramsay. Southern New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 377.

Similar to typical variety; smaller; shorter spines. Head, belly, limbs more spinous. Skull narrower, lighter. Beak longer proportionately. Head and body, 350 mm.; tip of muzzle to eye, 52 mm.; second hind-claw, 32 mm.; third hind-claw, 11·8 mm.

TASMANIAN ECHIDNA

Tachyglossus aculeatus setosus, Geoffroy. Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 381.

Fur covering head, sides, belly, limbs composed of hairs only, not mixed with spines; dorsal spines short, stout, more or less hidden by fur. General colour dark brown; head lighter. Third claw of hind-foot nearly as long as second, much exceeding fourth and fifth. Head and body, 490 mm.; tip of muzzle to eye, 60 mm.; second hind-claw, 49 mm.; third hind-claw, 41 mm.

LONG-BEAKED ECHIDNAS

Genus Zaglossus, Gill

The members of this group, which are easily distinguished from the ordinary echidnas, may have three to five claws, and a much longer beak, which curves downward, and is nearly twice as long as the rest of the head. Most of the species are furry, with fine quills; they are, moreover, larger than the Australian forms. One specimen, which lived for many years in the London Zoological Gardens, weighed upward of 35 pounds. So far as we know, their habits do not differ from those of the other echidnas.

BARTON'S LONG-BEAKED ECHIDNA

Zaglossus bartoni bartoni, Thomas. Mount Victoria, Papua, about 8000 feet. *Ann. Mag. Nat. Hist.*, (7) xx, 1907, p. 294.

Fur long, thick, entirely hiding spines over dorsal area, these being visible only on nape, sides of neck, rump, and caudal region. No spines on the belly. General colour black. Hands brown, grizzled whitish, spines thin and short. Beak long and curved, as in *Z. bruijnii*, but claws five in number. Head and body, 560 mm.

Zaglossus bartoni clunius, Thomas and Rothschild. North-east New Guinea (Saruwaged, Rawlinson, and Cromwell Mountains). *Ann. Mag. Nat. Hist.*, (9) x, 1922, p. 129.

Similar to *Z. b. bartoni*, but smaller in size, and with markedly more slender beak, its breadth at 40 mm. from the tip being 10 mm., as compared with 13 mm. in *Z. b.*

bartoni, and 12·8 mm. at 70 mm., as compared with 15·2 mm.

THREE-TOED ECHIDNA

Zaglossus bruijnii bruijnii, Peters and Doria. North-west New Guinea. *Cat. Mars. and Monot. Brit. Mus.*, p. 383.

Fur of head, body, limbs coarse, woolly, not or scarcely intermixed with flattened bristles ; few spines mixed through hair of back, colour white, bases brown. General colour uniform dark brown or black ; head much lighter. Claws three. Beak twice as long as head, curving downward. Head and body, 500 mm. ; tip of muzzle to eye, 126 mm. ; second hind-claw, 50 mm. ; third hind-claw, 35 mm.

GOODFELLOW'S THREE-TOED ECHIDNA

Zaglossus bruijnii goodfellowi, Thomas. Salawatti Islands, New Guinea. *Ann. Mag. Nat. Hist.*, (7) xx, 1907, p. 498.

Coat much more spinous and bristling than that of any other form of *Z. bruijnii* ; spines extending on under surface nearly to middle line of belly ; absent on groin and between forefeet, but present on chest and throat ; spines of upper surface about one inch in length, 2·5 mm. thick ; small spines of chest and belly measure 12 by 1 mm., white, grey base. Fur short, scanty, uniform black over body, yellowish on groin. Rostrum, 119 mm.

BLACK-SPINED THREE-TOED ECHIDNA

Zaglossus bruijnii nigro-aculeatus, Rothschild. Charles Louis Mountains, Dutch New Guinea. *Proc. Zool. Soc.*, 1892, p. 545.

Large ; limbs extremely robust, with short claws. Hairs long, bristly, sparingly scattered over body ; legs almost bare ; spines numerous, long, stout, horny, black. All claws broad, hollowed out ; middle one of forefoot, 19 mm. Length, 775 mm.

Zaglossus bruijnii gularis, Thomas and Rothschild. Foothills of Charles Louis Mountains, Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (9) x, 1922, p. 129.

Similar to *Z. b. goodfellowi*, but larger, lacks all spines on the under surface, and has heavier claws, especially on the forefeet.

Zaglossus bruijnii villosissimus, Rothschild. Geelvink Bay, Northern Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (9) x, 1922, p. 131.

Hair very long and thick, spines concealed. Head and body pale brown all over.

Zaglossus bruijnii pallidus, Thomas and Rothschild. Inland from Geelvink Bay, Northern Dutch New Guinea. *Ann. Mag. Nat. Hist.*, (9) x, 1922, p. 131.

Differs from *Z. b. villosissimus* in having a whitish head and pale yellowish-brown pelage.

FAMILY ORNITHORHYNCHIDÆ

PLATYPUS

Genus Ornithorhynchus, Blumenbach

The platypus is adapted to a semi-aquatic life by having broadly webbed feet, and to burrowing by being armed with stout claws. Its bill is specially modified for procuring small water-insects, shellfish, etc., from the bottom of the rivers.

The one species of this family of monotremes is common in most of the rivers of Eastern Australia, from Cape York to Victoria, on both sides of the Dividing Range, and also in many lakes and rivers of Tasmania. Though a quiet observer may see specimens about at any time of the day in unfrequented localities, it is generally not until the afternoon and evening that the platypus leaves its day retreat. You may look for it in the quiet pools and backwaters, but it is equally at home in the swiftest current. Secure in its natural element, it seems to feel that it can safely survey any intruder, and we have often noted it floating down the stream, sometimes on its back, with head and tail raised above the surface so as to get a better view. At the slightest sound or movement of the observer it will be gone in a flash, and be seen no more.

To find the platypus in its day retreat one must search carefully along the bank until its peculiar footprints in the soft sand or mud indicate a landing-place. Perhaps at the back of this there will be seen a hole leading into the bank—a shallow, short tunnel, in which an animal may be surprised.

The breeding-burrow of this monotreme is an elaborate affair, and involves a great deal of labour on the part of the parent; we think, the female only. To find it an observer must select a quiet pool, and search above highwater mark when the river is at its normal level for the openings. These, usually one, will be oval, arched above, and flat below, about 4 to 6 inches wide by 4 deep. The burrow penetrates the bank in an upward direction, seldom more than a foot or 15 inches below the surface, for a distance of from 14 to 60 feet, winding according to the nature of the ground and the obstacles encountered.

The platypus out of its natural element is a defenceless animal, and forms an easy prey for its many enemies, the naked young especially so. Thus we find that special precautions are taken to make the breeding-burrow secure. In following out the tunnel one will apparently come to a blind end, but this is merely a 'side-issue.' The real hole continues, but is blocked for several inches of its length with soft, worked earth, and this is repeated from two to nine times before the nesting-chamber is reached.

The nest is placed in a circular cavity, 9 to 12 inches in diameter, and is composed of a mass of river-reeds, gum-leaves, or grass. Here, in the spring, the female lays from one to three eggs, from each of which is hatched a curious little naked baby. Although the mother has no pouch, the young are held in position by the mother's tail to the lower part of the abdomen, where they can secure the lacteal secretion. It is not until about December that the young are haired and active enough to leave the burrow.

The platypus can be surprisingly active on land. It can run quickly, with the body well clear of the ground, treading on the claws, with the swimming membrane tucked under the foot.

The only note we have heard from an adult platypus is a low growl when the female is disturbed in her nest. This call may be answered by the young with a softer note.

Naturally it is thoroughly at home in the water, swimming and diving with ease and celerity. When on the surface it usually floats level, with the feet spread laterally, palms turned upward. It can, however, float on its back in a semicircular position, with the head and tail raised well above the surface—a position we have seen the crocodile use in Victoria Nyanza when surveying a canoe from a distance.

It is quite possible to keep the platypus in captivity, provided that food and living quarters are exactly suited to its requirements. It enters the water only to feed and get exercise, and at other times warmth and dryness are just as necessary to this animal as to any other. It will feed on prawns, worms, and shellfish.

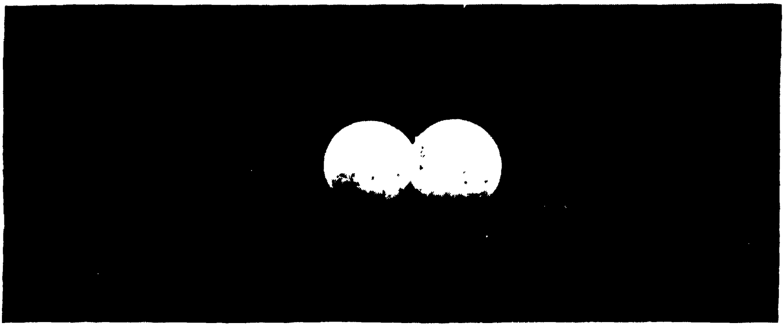
For the most part the platypus collects its food under water, locating small aquatic insects, worms, crustaceans, etc., on the bottom of the river with its remarkable sensitive bill. The food secured is secreted in the lateral pouch, until ground up by the horny plates which take the place of teeth. When puddling for food it will stay under water for two minutes or so, and appear on the surface for about 60 seconds between whiles for air, and to masticate the contents of the cheek-pouches.

The male carries a horny spur on the inner side of the hind-leg. This is hollow, and connected with a gland that secretes a poisonous fluid. We have never known a case where the animal has made use of this for offensive purposes, but we suspect that it does so. Moreover, there is an indentation in a similar position on the leg of the female, and it would appear that one of its functions is in connexion with the sexual embrace. Mating takes place in the water; we have seen a pair locked together floating down the current.

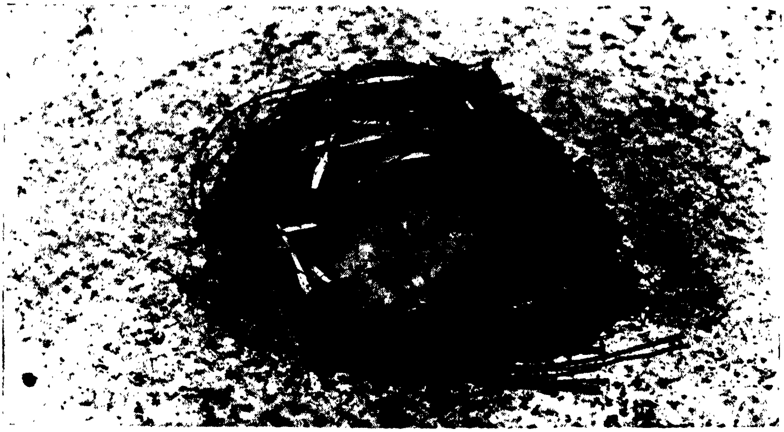
There is only one species, but this, being found in areas

102. Platypus (*Ornithorhynchus anatinus anatinus*)

103. PLATYPUS (*Ornithorhynchus anatinus anatinus*)



104. EGGS OF PLATYPUS



105. YOUNG OF PLATYPUS IN NEST

so far apart as North Queensland and Tasmania, naturally shows variation in the density of the fur. Specimens from the north are thinly haired, and have short under fur; they are also considerably smaller than southern representatives. Such variation has led to the description of the following sub-species.

PLATYPUS

Ornithorhynchus anatinus anatinus, Shaw. Coastal area of New South Wales, Victoria, and Tasmania. *Cat. Mars. and Monot. Brit. Mus.*, p. 388.

Form elongate, depressed. Bill and tail broad. Feet webbed; membrane of forefeet produced well beyond claws, posteriorly only reaching to bases. Anterior claws broad, blunt, posterior ones pointed. Beak smooth, evenly rounded, surrounded behind by soft, sensitive membrane; soft flap projecting over face and chin posteriorly. Body covered with more or less crisp, curly fur, under which is soft blackish under fur; hair on tail coarse, straight. General colour above brownish grey, shining, especially in young animals; under surface silvery yellowish grey, occasionally washed with port-wine colour; lighter mark above eyes; bill purplish black above, mottled yellow and black below; darker markings may be present round bases of limbs and in anal region. Hair may be more or less worn on tail of both sexes, but principally the female. Head and body, 320–435 mm.; tail, 118–136 mm.; beak (excluding flap), length, 55–65 mm.; breadth, 42–48 mm.; hind-foot, 43–65 mm. Male considerably larger than female. (See Figs. 102–105.)

Ornithorhynchus anatinus triton, Thomas. West of the Dividing Range, in the drainage area of the Murray and Darling Rivers; in South Queensland it ranges nearly or quite to the coast. *Ann. Mag. Nat. Hist.*, (9) xi, 1923, p. 178.

Larger than the typical form; skull in male upward of 105 mm. in condylo-basal length, with a narrowest rostrum breadth of 22–23 mm.; length of muzzle, 45·5 mm.; breadth across tip of muzzle, 34·5 mm.; interorbital breadth, 14 mm.; posterior breadth, 53 mm.

Ornithorhynchus anatinus phoxinus, Thomas. Dinner Creek, Ravenshoe, North Queensland. *Ann. Mag. Nat. Hist.*, (9) xi, 1923, p. 176.

External characters as in typical sub-species. Size least of the genus. Adult male: skull, 86 mm. in condylo-basal length, with a least breadth, in front of anterorbital foramina, of 17 mm.; length of muzzle from opening of the anterorbital canal, 38 mm.; breadth across tip of muzzle, 28 mm.; interorbital breadth, 12·5 mm.; posterior breadth, 39 mm.; head and body, 310 mm.; tail, 98 mm.; hindfoot, 47 mm.

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